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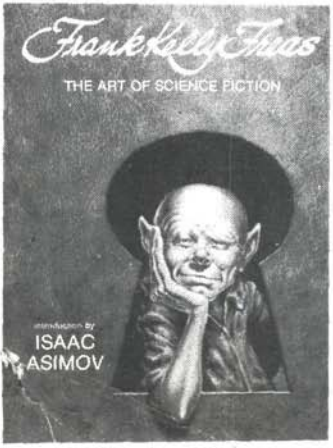

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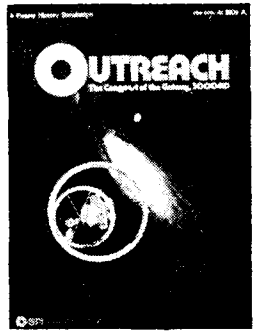

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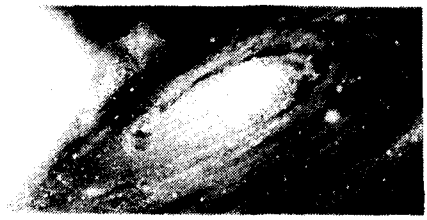

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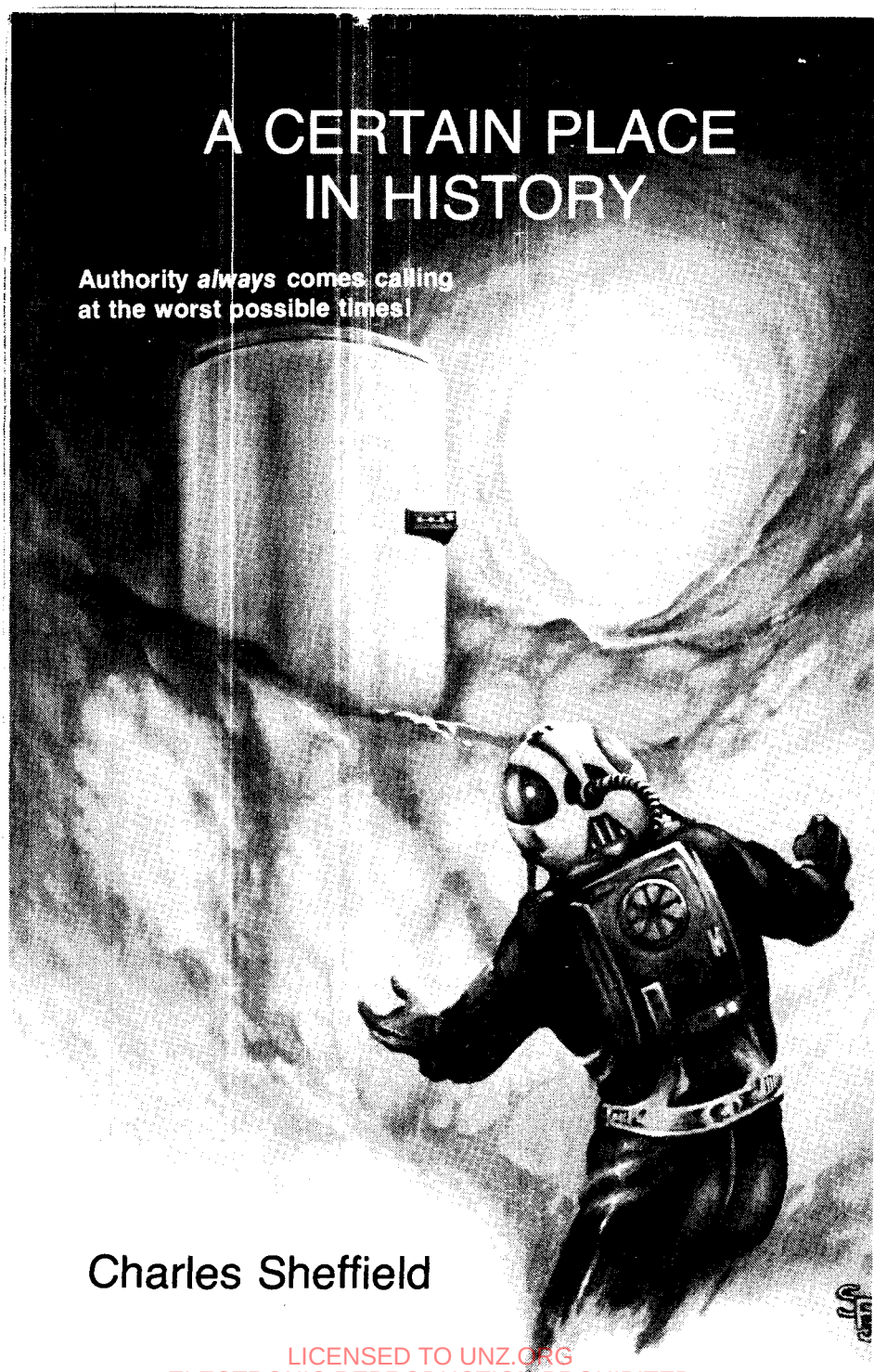
A CERTAIN PLACE IN HISTORY

Authority *always* comes calling at the worst possible times!



Charles Sheffield

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"THIS IS REALLY rather nasty. Why did you let it go so long without attention? You should have come in for treatment weeks ago."

The dentist who was working on my ripely abscessed upper molar had a habit, common to his profession, of trying to conduct a conversation with a patient whose mouth was wedged open like a yawning hippopotamus. An accurate answer to his question would take twenty minutes and involve—at a minimum—mushrooms, space warps, high finance, aliens, the asteroid belt and my personal reputation. I rolled my eyes and said "Aa-gning-aa," or words to the effect. The answer seemed to satisfy him and he turned the conversation to local politics.

It really isn't easy to know where to begin. With the aliens? According to common myth, it isn't really possible to hate an alien. If and when we meet up with some, the argument goes, we should get on with them very well. Our hatred is reserved for our own kind. I happen to know that idea is wrong. No human has ever met a Kaneelian, we don't know where or how they live, or even what size and shape they are. But they cost me a million credits, they gave me the worst three days of my life, and they may make the name 'Henry Carver' go down in history as a big joke. I have a strong and personal hatred of Kaneelians, the whole wretched species.

That's obviously the wrong place to begin. I get carried away. Let me begin, objectively, with the tooth.

It was a left upper molar that had been filled a couple of times already, and it was beginning to give me trouble again. Two hundred years ago, in the bad old days before medical science was perfected, a tooth was pulled out when it gave trouble. It is now possible, thanks to partially effective nerve-regeneration techniques, for the same tooth to cause periodic anguish for a good fifty years, with enormous associated cost. The ache was getting bad enough for me to consider and put off a visit to the dentist when I had a videophone call from Izzy Roberson.

Izzy was always worth talking to. An old friend of my partner, Waldo Burmeister, he had suggested some profitable deals for us in the past, and wasn't a man to waste your time with small stuff.

"Got something good for you, Henry," Izzy's cheerful image began. "Know what agaricus campestris is?" He was a tiny, bouncy man, hopping up and down as usual in front of the screen. He had a great fondness for tall women, who loomed high above him and always made me think of the old story of the midget and the showgirl.

I groped vaguely after law-school Latin. "Campestris. Something-or-other of the fields?"

"Not bad, Henry, not bad at all. Agaricus campestris—it's mush-

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rooms. meadow mushrooms. Hold on a second, I'm going to put the scrambler on."

The screen became random color for a second, then cleared again as the unit on my phone picked up the coded unscrambler.

"Safe to talk now," he went on. "Henry, we want you to be a front man. We're all set to develop a mushroom monopoly. If we pull this off, you'll get all the commissions."

A mushroom monopoly sounded about as valuable as a corner in yak-wool hats. Cut off the supply of meadow mushrooms, and it seemed to me that people would happily eat something else. I mentioned this to Izzy.

"Henry, don't you ever look at the science sections? They don't grow the damn things for eating, they use them to extract the transplant catalysts. There are only three companies in the business, and my clients now control two of them. We want the third, but we have to work through an intermediary."

I understood that easily enough. Laws on monopolies were getting stricter all the time. It was a situation I'd been involved in before and I knew the main limiting factors.

"How much of the stock do you need, Izzy? Where's it traded, and what do I use for money?"

"It trades right here, on the Tycho City Board. If we can get twenty-seven percent of the voting stock, we'll have clear control. We already bought eight percent through a holding company and we've been promised votes on another eleven percent on a trade-for-favors base. We want you to get the other eight percent any way you can."

"Expenses?"

"Sure. But you only get the commissions if you buy us all we need. Finish with seven percent and you get nothing. Here are the credit number and stockholder positions you'll need to do the buying."

I pressed 'Record' and he flashed me a stock I.D. list and a fourteen-digit code on the Tycho City Central Bank.

"One other thing, Henry. We've got a deadline. Midnight, U.T., twelve days from now. Think you can make it?"

It would be tight, maybe, but it should be possible. I thought for a moment, then nodded just as the door behind Izzy opened and a tall blonde walked in. He glanced around, waved a quick farewell to me and cut the connection on the tableau of Snow White and Happy. I was glad to see him go so I could get started at once. I forgot my nagging tooth and began to check the stock prices.

If you've ever been involved in a quiet stock purchase, you know there are two main factors: A low profile, and fast action. If people think there is a take-over in the wind, they get greedy and hold on to what they have. The last percent

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always costs the most. And if you don't do it fast enough, the professional market analysts will move when they see a lot of quick transactions in a quiet stock, and start buying against you on a speculative basis.

After eight days, I had things moving along nicely. Six percent of the stock I needed was committed to a forward buy, held for three days, and I was expecting a call or a visit on the remaining two percent. I sat in my Tycho City apartment, one ear tuned to the phone and the other to the door chime. Visions of sugarplums danced in my head, and when the door rang, I leaped to answer it.

I've become used to some unusual intermediaries in financial deals, but the man who ducked his head in through the doorway was the strangest yet. Huge, straw-haired, jutting-jawed, steely eyed —you can supply the other adjectives yourself. It added up to the cliche hero of a space opera. He came in, looked at me, past me, and around the apartment. Finally he shrugged slightly and looked at me again.

"Henry Carver?" There was surprise in his voice.

"Yes. You're from Securities Investment?"

He made himself at home on my couch. "Never heard of them. Look, let me make sure there's no mistake. Are you Henry Carver, the man who worked with Gerald Mattin on the development of the Mattin Link?"

Hospitality and politeness have their limits. Anyway, that episode with the Mattin Link is not one of my favorite memories. "I don't know who you are, or what you're doing here. But I have an important business visit due any minute now. If you are not from Securities Investment, I'm afraid I must ask you to leave at once."

"Sorry, Mr. Carver. I can't do that." He fished in his coverall pocket and pulled out a mag strip I.D. "Check that out, then let's talk."

He was depressingly sure of himself. I fed the strip through the phone connection and watched the I.D. appear on the screen: Imre Munsen, Special Investigator, United Space Federation; authorized to commandeer the use of equipment, services and personnel for Level Four System Emergencies; classification of current assignment (you've guessed it): Level Four.

"Now you know who I am, Mr. Carver. Before we go on, I have to be sure that I know who you are. Are you in fact the man who worked on the original Mattin Link—the man who survived those first experiments?"

"I am, but that was a long time ago. I don't know anything about the Links they have nowadays."

"That's all right. We need help from someone with a fresh mind, not tied to current theory. First, I

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must swear you to strictest secrecy. A situation of unprecedented danger to the human race has arisen. If you reveal what I tell you to a third party, you will be guilty of endangering the public welfare and will be charged accordingly. You know the penalties.''

I did indeed. Anything the court chose to inflict. It was rather like the old military courts-martial. No appeals, and the prosecutors, jury and judge were all the same people. My stomach began a rumble of anticipatory fear.

''Mr. Carver,'' Munsen went on, ''it will be simplest if you listen to me first without asking questions. I have studied your file, so I know your capability and pattern of rapid response. But hear me out, please, before you begin.''

What was the man talking about? I wondered what was in the file. And what about my business appointment? Munsen had better get on with it and go away quickly. There were a million credits waiting for me—if I could conclude my mushroom stock purchases in time. I decided to let him have his say, then tell him at once that I couldn't help.

It's best if I summarize what he said to me. Munsen was just the sort of starry-eyed, deep-chested idiot he looked. Patriotic, fearless, decisive, clean-living—we seemed to have absolutely nothing in common, the two of us. His explanation was full of irrelevant stirring speeches about our future, and the need for all of us to give our utmost to human advancement. It was enough to make a rational man sick.

Six weeks earlier, as Munsen told it, a party of six had chartered a space yacht for a scenic tour of the inner Solar System. Milton Kaneely, the holovision star, had made the rental. Three men and three women were on board—and with Milton Kaneely, for 'scenic tour' you could safely read 'drunken orgy.' They had careened randomly around the Moon and off past Mars into the asteroid belt. Blundering along there, they had landed on a rock fragment less than a kilometer long—and stumbled across the first evidence of an alien race. On the asteroid, in a big rock chamber, sat the space warp. Kaneely and friends didn't know it was a space warp—or even that they had found evidence of aliens. They thought they'd found an unmanned USF Navy station. They sent a joking message back to Tycho City, complaining about the lack of a station emergency grog supply, and rocketed off for Chryse City.

The USF Communications Group would have written the call off as a joke, except that on the way to Chryse City the Kaneely party had encountered another asteroid—this time at a relative velocity of five kilometers a second. The accident, so far as anyone could tell, had nothing to do with their earlier landing, but the investigation group had

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taken a look at that asteroid too, to make their report complete. They found the space warp. Not knowing quite what it was, they were still smart enough to recognize it as an alien artifact. That was when Imre Munsen had been called in.

"The most irritating thing," he said to me, "is the complete *randomness* of it. The Kaneelians didn't try to hide the space warp from us, but they didn't give it any kind of beacon, either. For all the help we had from them, it could have been another thousand years before we stumbled across it. We still have no idea how long they were on that asteroid, what they were doing in the Solar System, or when they left. They might come back any time."

He looked gloomy and irritated. I stole a glance at my watch. It was getting late, my tooth was aching again, and there was still no sign of my mushroom man.

"This whole matter is really interesting, Mr. Munsen," I said to him, polite and insincere. "But I'm a lawyer, you know, not a scientist. I can't think why you want me involved in all this—unless you are planning to sue the aliens for negligence."

He cheered up a little and smiled at me. "You underrate yourself, Mr. Carver. I like to see that in a man. Our computer selected your file from millions, as the best person we could get for this job. I read your background myself before I came here, and I won't be fooled by a modest appearance. The first man to transfer through the Mattin Link—and the only survivor of those early experiments. The man to whom Peter Pinton entrusted the secret of Pintonite, and one of two men to come out of that alive when Pinton was killed."

Munsen shook his head admiringly. "It's not just a question of hard work and intelligence, Mr. Carver. Lots of people have those. You also have good luck—and you've got guts."

Not only that, I fully intended to keep them. I had no idea where Munsen had got all that information—accurate, as far as it went, but it didn't go far enough. I felt like saying, "No, no, you've got it all wrong. I'm not brave at all. I'm a certified coward." But I didn't think it would make any difference. Munsen looked like a very determined man. Instead, I said, "I only wish I could help you, Mr. Munsen. But really I have no idea what I could do for you. I have pressing business obligations, and I know nothing about the aliens."

"You know as much as we do, Mr. Carver. I want you to take a look at that space warp and use your intuition and experience."

My intuition and experience told me to stay as far away from it as I could.

"It has our group baffled," Munsen went on. "It provides instantaneous transfer, the same as the Mattin Link, but it's a lot more

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flexible. For one thing, it seems as though the exit points can be anywhere. For another, you don't need Link equipment at the exit. We've been able to send signalling devices—not people—through it, and they come out some place in the Solar System. Some random place. Two disappeared, and we think they must have gone into the Sun."

Worse and worse. So far, it sounded riskier than the Mattin Link, and I'd had my fill of that long ago. "You tried to send people?" I asked.

He nodded. "Volunteers. But there's some kind of a sensing device on the side of the warp chamber. It won't send living multi-celled organisms. Just sits there humming when we try it. It's very disappointing. The Kaneelians built in some kind of control on it and we have no idea how to change the settings."

"Why not take it apart?"

"We'd love to. As soon as we know how it works, we will. At the moment we're afraid we may ruin it completely if we tamper with it. We'd like to study the separate pieces. For one thing, it seems as though there are all-temperature superconductors in the control box."

What was an all-temperature superconductor? I shook my head firmly. "There's not a thing I could do for you, Mr. Munsen. It's outside my field."

Munsen turned three moods meaner. "Mr. Carver, I don't think you understand the situation. I am *requesting* your cooperation. But I am not really offering you a choice. We need you. If you persist in your attitude, I will be forced to send you for a hearing—on Earth." He smiled a horrid smile. "Your record suggests that you prefer not to visit Earth. In any case, I expected you would welcome a chance to serve humanity."

A hearing on Earth. I shuddered at the thought. There were people there who'd love to get their hands on me. Whatever Munsen's project, I couldn't imagine it would be worse than that. Even so, I wasn't prepared to give up my million credits without a struggle.

"Don't get me wrong, Mr. Munsen. I'd be only too happy to go with you and take a look at the alien machines. But I have big responsibilities here. I can't spare the time, particularly just now."

His manner warmed a little. "Of course, I know you're a busy man. What I have in mind wouldn't take long. I want you to take a quick look at the alien equipment, then you can come back here to the Moon and think it over, see what ideas it suggests to you. If necessary, we'll arrange a second trip later—but that might not be needed, if we can use your ideas without your presence."

"But can't that first trip wait a week?"

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He shook his head. "I'm afraid not. Time is important. Every day wasted could mean danger to us all. Until we understand the space warp, we won't feel safe—the Kaneelians could come back any day, and we'd be helpless. I will guarantee you that if we leave tonight, I'll have you back from this trip in forty-eight hours. That's the best I can offer, and I tell you that I'm stretching the rules to promise that."

Two days away would leave only two more days to finish the stock deal. I didn't like it at all, but I sensed that it was the best offer I'd get. For a Level Four emergency like this one, Munsen could have me shot, and no one would ask him for the reason until it was too late.

"Give me the time to make one videophone call," I said. "Then I'll be ready to go. What do I need to bring with me?"

"Not a thing—we'll fit you out at Headquarters." He looked pleased with himself, and what he probably thought of as his subtle powers of persuasion. "I must say, Carver, I'm feeling relieved to know you'll be working on this job."

I postponed my mushroom meeting for two days—much to my contact's surprise, who knew something tricky was going on financially. Timing on these deals is everything. Then I swallowed a pill for my aching tooth, and off we went. It made me very pessimistic for the future of humanity, to think that they had to rely on people like me to handle their emergencies.

Two hours later we lifted away from Tycho Base on a high-speed USF Navy cutter. Free fall never did agree with me, and never will. I was all right during the eight-hour trip to Kaneely's asteroid, a forlorn chip of rock in the middle of nowhere, because the ship was under acceleration all the way. But the temporary station that the Navy had set up on the rock itself had no gravity to speak of.

We didn't bother to dock in the usual way—there was only a big pressure dome, on the surface of the asteroid. We hovered close to that,

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and went across to it in our suits. Inside the bubble about forty men and women had assembled. Munsen, like the ham he was, made a fool of both of us.

He made a stand-up speech. "Men," he said—ignoring the women completely. "We've had a hard time of it, this last month. Now there's a ray of hope, a light at the end of the tunnel. Here is the man we've all waited to see, Henry Carver. Henry Carver, the only man—." And away he went.

I endured it, averting my eyes from the audience, which seemed to be lapping it up. After Munsen dried up, they went into a very long and—to me, at any rate—completely meaningless briefing on the work that had been done so far to explore the Kaneelian chamber in the rock. I nodded occasionally, but the technical discussion was beyond me.

Boiling off the jargon and gibberish, what was left seemed to be simple enough. The asteroid chamber was completely empty except for the space warp, and nobody had any idea at all how that worked.

You put a signalling beacon, or some other object, inside it and then pressed a bar on the outside. Instantly, the beacon or whatever appeared somewhere else, anywhere from ten thousand to five hundred million miles away. The beacons that had been recovered—they had lost another since Munsen briefed me—were all intact and apparently unscathed by the jump. But their positions when they appeared were completely random. Put a man or an animal inside the warp cylinder, and press the bar again. Nothing at all happened, except a slight hum from the machine.

They had tried men in twos and men in threes; men in lead suits to screen testing radiation; men in suspended animation; men who had been knocked unconscious; and—Munsen would try anything—dead men. Of these, only the last were accepted for transfer and as usual they told no tales.

The Navy still had plenty of volunteers, going dutifully into the space-warp enclosure and then, hours later, floating back out again when it was clear that nothing was going to happen. There was no doubt that they were all getting discouraged.

I wasn't keen to go near the Kaneelian machine—you never knew when it might suddenly decide to work, explode or otherwise do something drastic. On the other hand, I very much wanted to get the thing over with and go back to Tycho City for my unfinished business. When the briefing ended, Munsen and I floated together down into the big chamber under the surface of the asteroid.

It was actually three big spaces, inter-connected through tall archways. Two were completely empty and in a corner of the third sat a

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solitary, dull-grey metal cylinder, about two meters wide and three meters high. The space warp. You climbed in through the open top, and on the outside there was a gray bar that activated the system—or failed to if there was a man inside.

"Why are the arches so big?" I asked Imre Munsen over my suit radio. "Were the Kaneelians all ten meters tall?"

"We don't know. They might have been. On the other hand, they should have been our size, or near to it, to fit into the warp. For all we know now, they may come in a variety of sizes. Why do you ask?"

A good question. I was just making conversation to put off the next step. Then I had an idea. "You say it will send single-celled animals through. Is it possible that the Kaneelians were single-celled? Could a single cell grow to the size of a man?"

"I don't see why not. It wouldn't solve our problem. It would explain why a single-celled animal *can* get through—but not why multi-celled animals can't. Why would they want to stop a transfer?"

I shrugged. Since I don't understand human behavior at all, it seemed presumptuous to guess at the motives of the aliens. Munsen gestured at the top of the warp cylinder.

"I'm going to take a look at the inside, Henry. Coming?"

"Best if I stay outside, I think," I said casually. "The control unit's out here. I want to watch what happens to it when you go inside."

Munsen had made it quite clear that at some point he expected me to take a look inside that ghastly cylinder, but I saw no reason to rush in. He nodded at me. "Makes sense. Once I'm inside, press the bar. You never know, I might get lucky."

He floated up, then down into the open top of the cylinder. After a couple of seconds, his voice came over the suit radio. I worked the bar, and hoped. There was a low, steady humming from one of two square boxes on the side of the warp. It went on for about five seconds, then stopped. I waited.

After twenty seconds I heard Munsen's disappointed voice. "No good. I might as well come out again. There's a sort of metal piece inside here that moved backwards and forwards when I was waiting for the warp. I think it's the scanner. Let's change places and you can take a look."

It was the moment of truth. If one of the boxes contained the scanner control, then the other box was presumably the warp mechanism itself. While Munsen was getting out of the cylinder, I took a multi-purpose belt attachment from the waist of my suit and opened up a long dur-steel spike. Its use had always mystified me—it looked like an ice pick, but presumably wasn't. I drove it as hard as I could into the soft-plastic middle of

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the box that I thought contained the warp mechanism. Then—a bad mistake, as I later realized—to be on the safe side, I drove it just as hard into the other box.

There was a satisfying sizzling noise, like a damp onion ring dropped into very hot fat. Feeling much reassured, I put the spike away and waited for Munsen to join me.

"Let me stand here and watch what happens," he said. "Did you see anything at this end when I was inside?"

I shrugged, then realized he couldn't see that well inside my suit. "Just the hum you told me about—from that box."

I hoped my efforts to gain a little insurance would not be visible to Munsen. With the old butterflies in my stomach, I pushed gently off from the floor, floated up and then, with a slight down-boost from the jets, dropped slowly into the warp cylinder.

Despite my steps to deactivate the warp, I had the feeling that I was in trouble: I think the thing that separates a real coward from ordinary men is an extra sense that provides him with a continuous stream of information on all dangers, real or imaginary. To my eye, the open top of the cylinder gaped beneath me like the mouth of Hell.

I touched the warp floor, and stood there breathless. After fifteen long seconds, when nothing at all had happened, I drew air into my complaining lungs. It felt good.

"It's no good, Munsen," I said, hoping my relief didn't show in my voice. "Nothing's happening. I might as well come out."

He didn't answer. I straightened my legs to push off from the floor of the warp cylinder. They made no contact. I looked down, then up. In both directions, there was a featureless gray nothingness—and it was the same on all sides.

I was baffled. I couldn't be in the warp transfer—that was instantaneous. Then where was I? The question became more and more relevant as time went by and seconds became minutes.

It would be misleading to say that I panicked when I realized the fix I was in. I had been in a state of terror ever since Munsen made it clear that he expected me to go inside the warp chamber. I couldn't get much higher on the panic scale. Even so, I didn't at all relish the prospect of starving to death inside my suit, or maybe popping out inside the Sun. My water and air recycling were almost perfect, but I would run out of food in a week.

After an hour of these cheerful thoughts, a new factor entered. My tooth erupted again. It had been sitting back, quietly throbbing, ever since we reached the asteroid. Now it woke up with a vengeance and began to poke red-hot needles down through the top of my head. I couldn't get a finger in my mouth because it was in the suit, but I ran

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my tongue over the left side of my inner gum and was rewarded with a bolt of lightning through my left temple. The gum felt squishy and I had a peculiar taste in my mouth. The pain grew steadily worse.

There seems little point in a detailed recapitulation of the next three days, If—as seems unlikely—you've been through a similar experience, you know what it was like. If not, no words describe it. Fortunately or unfortunately, the infection from my tooth distorted my time sense. I ran a high fever and was delirious for at least part of the time. Teeth were much on my mind. I remember saying, out loud, 'the tooth, and nothing but the tooth,' and "uneasy lies the tooth that wears the crown."

One thing is clear. Somehow, the combination of solitude, fear, pain and fever worked a strange synthesis. Just after I had said, "But why put the warp controls on the *outside*, not the inside?" I understood, from nowhere, the purpose, logic and practice of the Kaneelian space warp. I knew why we couldn't see a pattern in the points of exit, and why we hadn't been able to send living things through it.

The knowledge did me no good. My misery went on. Then, long after I had died, gone to Hell, and been sent on from there to a worse place, the gray ambience suddenly vanished and I popped out into the black, dazzling vacuum of normal space. My suit emergency signal switched itself on and four hours later a USF transfer vessel picked me up. I had been warped almost two million miles away from the asteroid. The ship's robodoc clucked over me and pumped me full of antibiotics, tranquilizers and happy pills. By the time we reached Tycho Base I was stoned out of my mind and feeling pretty good.

The trip took twenty hours. When we finally got there, I saw from my watch that my mushroom-deal deadline was a thing of the past. Goodbye million credits, I thought cheerfully. Hello Imre Munsen.

He had arrived at Tycho shortly before I had. Would you believe it, he wanted to pump me for information before we'd exchanged two words? He was in a fine state of excitement.

"Henry, you did it! We knew you would. What was the trick to it? How did you know what to do?"

I had a clear choice. I could tell the truth, and probably be shot for sabotaging priceless equipment. Or I could explain that I had intentionally disabled the space-warp selection mechanism to make it accept living things—and I had, of course, bravely put myself through it as a test.

No prizes for guessing what I told Munsen and his cohorts.

Naturally, I was the hero of the hour. USF dignitaries kept coming to see me, more and more important ones, finally capped by a visit from

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the eminent USF President himself.

After two days of steady adulation, I'd had more than enough and wanted to go and attend to my long-neglected tooth. I had guarded my secret of the space warp closely, after I heard what had happened when I had left the asteroid. Munsen had tried to send himself through and the machine wouldn't do it. Maybe my transmission had been its last dying gasp, or perhaps it was self-repairing and had restored itself to its original selective condition.

I left Tycho Base with their praises ringing in my ears and went back to the City. I hated it. God knows what they'd put into my computer file about this one. I didn't want to be dragged out again next time they needed a hero.

Back in my apartment came the unkindest cut of all. I'd been answering questions and shaking hands for two full days at Tycho Base, in no real hurry because my mushroom monopoly deal was dead. But when I arrived back home and switched on the holovision, the date was three days earlier than my watch showed. The warp *was* instantaneous, but only to the outside observer. No wonder my delirious moans had been completely ignored when I was picked up—no one understood that I'd spent three subjective days in that suit.

If I'd known the real date, I'd have had time left to sew up my stock deal and get my commissions after we got back to Tycho. Instead, I'd sat about for days as a USF showpiece for their VIPs. Most annoying of all, I might have guessed that the warp might not be instantaneous for the transferred object—because I knew what the warp had been used for.

The Kaneelians had come to the Solar System for a while, then packed up their furniture and moved on. They were ten meters tall, but like humans in one respect—who bothers to take the empty trash cans with them when they move house? Who cares whether their garbage-disposal unit sends the trash a million miles or a billion miles, or how long the garbage believes it is in transit? The scanner made good sense too. The Kaneelians were like humans in some other ways—household appliances had to be safe and child-proof.

Imre Munsen had declared, in one of his more inflated introductions, that I had a sure place in history. I could imagine it, ringing down the ages. Henry Carver, the only man since time began to be accepted by, and transferred through, an alien garbage-disposal unit.

I sat in front of my holovision, thinking of my lost commissions and wondering how long it would be before anyone else came to the same conclusion about the function of the Kaneelian space warp. At last I reached for the videophone and made a dental appointment. ★

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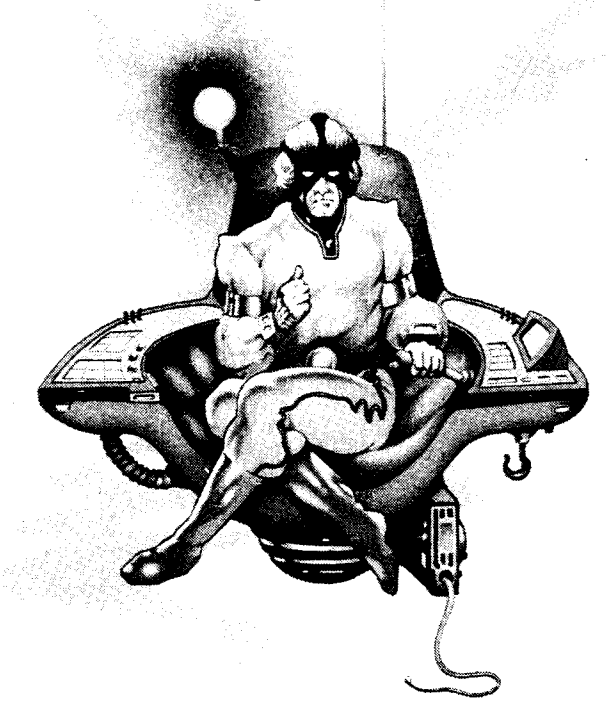
THE PROLOGUE TO LIGHT

Tony Sarowitz



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For them, it was like a pilgrimage—but with destination unknown.

RATTRACK HURRIED. His shoes slapped against the long steel avenue of the city at night. His back was straight. He was the picture of a man with somewhere to go, something to do there, a very unusual sight in the night city. There was enough light to walk by, the glow of a few high apartment windows reflected in the shiny metal street. Some of these lights moved as he walked, moved as the apartments and buildings silently rearranged themselves without disturbing the sleep of the dayfolk. The city was preparing itself for tomorrow, working its changes at a time when no one of consequence could see.

Behind him, the sound of Clave's chair rose in pitch, if such a wheezing, grinding, unhealthy mechanical noise could be said to have an honest pitch. The chair pulled alongside and matched Rattrack's pace, one side noticeably listing. The spotlight in front glowed faint, almost invisible red along its filament. The entire carriage wobbled slightly as Clave leaned forward, shifting his weight to his knobby elbows.

"She might not make it, Rattrack," he said. "The grid changed again last night. It's become all twisty-turny on the west end. She may be stuck there."

It happened, of course. It happened that the streets changed, that a building would slip down into the street and reappear elsewhere, transforming a cul-de-sac into a night-long prison. It even happened that you simply became lost in some newly erected street maze, arranged for the amusement of the dayfolk. But it didn't happen often. You could always get your bearings if you found the steel avenue. The steel avenue never changed, or at least never had. It cut east to west like a river flowing through the heart of the city, or the mirror by which the city could see its changes. It was a rule of the game.

"She's here somewhere," said Rattrack, and he kept walking.

"Don't get all fuddy mad, Rattrack," said Clave. "Her meal may have come late. The machinery could be broken. She might have decided not to come." And those were possibilities too.

"Back away, Clave," said Rattrack. "She's met me for the last forty nights and she won't miss this one."

"I'm sorry, Rattrack. Excuse me. Sorry." Clave spun his chair around and fell out of sight to the rear. The grumble of the machine faded until it was no more than a whisper, about one hundred meters away.

Big man, Rattrack thought. Big man to chase off a runt like Clave.

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But there was not time to waste on awkward apologies. Best to forget it. Clave would forgive; he always did.

Rattrack listened to the racket of the chair, reduced to a breath behind him. He liked that sound. It reminded him of the nights when he was a Troller, when the chair was his to skim low through the dark streets. Damn them for taking it from him. Damn them. . . Them? There was no such easily fingered them," not the Trollers, not the five million dayfolk asleep behind the black walls of the buildings. It was only the city, the city and its games. Double damn the city then.

A distant scream of high terror came from his left, then silence. It was only a sound of the night city, nothing unusual in a scream. He went on, ears keyed to the slap of his shoes, the whisper of Clave's chair, the dead silence of the city around them. Directly overhead he saw the faint reflection of a top-floor apartment light on the city dome. Something nice about that elusive glimmering on a field of pure black. The undersized tunic chaffed at his underarms and he shrugged with discomfort, walked on. The muffled chutter of a Troller passed somewhere out of sight.

He heard the sounds before he saw the woman: a dull thump, scrapes and shuffles, the slap of running feet, again the thump. There were few lights here, and Rattrack nearly walked by before he saw her huddled against the building. He hesitated, went over. She looked up at him. Blood covered one eye and ran down her chin. The tips of her hair were blonde, but the rest was black and matted. She lifted her hand to him and he helped her up. On her feet, she couldn't seem to orient herself. She stumbled away and back, then fell up against the building, each breath like the blow of an ax. She smiled. She pushed herself away, reeling like a drunkard until she stopped in the middle of the street. She steadied herself, lowered her head, and ran full tilt into the wall. There was a crack when she hit.

The silence was complete. Clave had run from the disturbance, of course. Rattrack took a step, was appalled by the sound of his footfall. But this was absurd. It was only a death, and the night was waiting, Zylyphony was somewhere. . . He knelt and touched her arm. She must have been an artist. Artists often gave in early, no inks, no paper, no clay, no visions inspired by the chew.

He heard the chutter a moment before the Troller's spotlight swung onto the avenue. The light flashed along the metal street and Rattrack caught a glimpse of a shape, someone standing against the buildings across the street, watching.

The Troller came up and hovered in his chair a few meters away. "Zero one six. I've got it." He swung the muzzle of his roper

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around at the dead woman, pushed the button, and sat back, popping a chew in his mouth. He yawned and stared at the black sky. At no time did he look at Rattrack or even so much as motion in his direction. A thin white ribbon snaked from the roper and settled around the woman's head. It began to wind tightly and evenly, covering first the bloody scalp, then moving down to the forehead, the eyes, mashing the nose flat and lifting the head slightly so as to loop underneath.

Rattrack said, "Good, you enjoy your work."

The Troller said nothing, did not move. The roper covered the corpse's neck and started down its shoulders, pulling the arms tight to the ribs.

"It's a tough job," said Rattrack, "really important work, and a marvel that you handle it so well."

The roper swathed hips, then bound legs and feet. The line slipped back into the muzzle, dragging the long white cocoon off the ground until it dangled by a single thread, the head bare centimeters off the ground. The line snapped and was snagged by a small hook on the underside of the chair.

"She's secure now," said Rattrack. "You're a real hero."

The Troller swung the spotlight at Rattrack. "Stay out, duddy," he said. "Four hours to light. Stay out of your scuddy little hidy-hole just a minute too long. I'll find you. I don't forget a face."

Rattrack laughed. He forced himself to look into the explosion of light. His eyes were on fire. "You too, duddy," he said. "Wait till you make a mistake and you're out in the nightlife without your chair. See how you get along. I don't forget a face either."

The Troller spat and swung his chair past Rattrack's nose. He sped off, riding low so that the corpse dragged along the ground.

Rattrack laughed again. "Ho Zylyphony," he called, staving off the silence, waiting for his eyes to work again. "Did you see that? There goes one more Troller who knows Rattrack." He started across the street toward the shadows where the Troller's spotlight had revealed her. He knew it must be her. "Zylyphony? Come out!"

The shadows were empty.

He began to stroll down the street, brushing his hand along the satin building facades. She was here, somewhere. Then he heard the buzz and flattened against a wall. It was a warden.

It came up the street, a fist-sized metal beetle, a blur of speed, a flicker running through each patch of light. It was heat in motion, could burn away any stain, could cut through a man like cheese and leave a well-cauterized stump. It was perfect, untouchable, and Rattrack hated it.

The warden slowed at the blood on the street, moved crab-like over the sea. It went up the side of the

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building and down again, then sped off the way it came. It took seconds, and nothing remained, no char, no unobserved splatter, nothing.

Rattrack stepped away from the wall. There was a sound, he turned, and Zylyphony was standing just out from the buildings a few paces away. She was looking. . . no, not at him. It seemed that she never looked directly at him, but the thinnest of hairs to the right, or left, or above. Her hair was a garland of dark curls. She was like one of the apartment window lights, impossible to reach, framed by night.

He gave her a smile though he knew she would not return it. "Did you see me with the Troller?"

"Yes," she said, and somehow the way that she said it, eyes away from his, a solitary nod without enthusiasm or even familiarity, stole the victory from him.

He felt for a moment that he could take no more, that this small hurt would burst the dam that bound his entire ocean of pain, that he would be finally ruined, forced over the edge of the abyss. Not yet. He closed his eyes, felt it all settle inside of him. It seemed, had seemed for some time, that his body was no longer a simple package of blood and tissues. It was an envelope for his anguish, his hate of the city. To strike a spark of life in this dull-eyed woman was no longer a game. The joke had gone too far, had turned sour and then rancid. Forty nights, and now he knew that, like everything else that had happened in his life, again it was the city trying to make him small, diminishing him by reducing this woman to nothing and throwing her in his face.

He stepped over and took her arm. "Walk with me," he said. And she came along as he had known she would, not willing, not protesting. She just came along. To their right, a building slid noiselessly into the street, a stately vertical descent. Before the roof was level with the street, the building behind it started down, and the one behind that, one after the other until a new street led off into the dark. He would take her to the fountain again (if it was still there) and do. . . something again.

They turned off the steel avenue into deeper shadows. Before they had gone far, the sound of Clave's chair came through the night and took up its station, one hundred meters behind.

As he came into the courtyard, Rattrack saw two men hunched furtively in the light. They muttered his name to each other, and crept away into the night.

The fountain was still there, and again it had changed. The first night they had seen it, nearly two weeks ago, it had been little more than a large flat basin, a few sculpted figures, a few climbing blocks. Each night it had grown, and now it was a huge forest of thin red towers and spiral chutes that climbed perhaps

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half as high as the buildings. It glowed with a pale yellow light, bringing an illusion of animation to the dark circle of buildings standing shoulder to shoulder around it like cautious spectators. It was a spectacle in still-life. It was Rattrack's favorite mystery. Why only this in all the city to relieve the black of night? Why did this and nothing else change its shape by day? The towers and pools were dry now, as they would always be at night, but Rattrack saw water. He closed his eyes and was sliding down a chute, the tall one in the center, a twisting kilometer-long stream of water with the city revolving around him and the chew in his bloodstream playing tricks with his eyes and brain. He imagined the slide becoming a pool, and then perhaps a great jet of water to send him back to the top while showering those below. To ride a waterfall. He could have cried.

He slapped his thigh with the flat of his hand, felt a satisfying sting. "Come on," he said to Zylyphony. "We'll explore."

She stepped back and sat on the black street, looking down.

"All right then," he said. He would not let it hurt. "Stay here." He set his eye for the pinnacle of the tallest spire, clambered over the uneven blocks on the floor of the fountain, and began to climb.

The banked walls of the spiral channel were purchase for his hands and the slick soles of his shoes. There was nothing to his left but open space. It was a long climb. Halfway up, when he had begun to tire, he stopped to take off his shoes and wipe the sweat from his palms. He looked at the ground. Zylyphony was dimly lit by the fountain glow, small as a marble. She seemed to be looking away, although he could not be sure. What must he do to catch her eye? Should he scream and wave his arms? Would she look up if he jumped? Clave was a distance from her around the perimeter of the fountain, disconnected from his shadow by the space beneath his chair. Rattrack looked back at her. She was not watching. He dropped his shoes over the edge and started up again, pushing for speed now, trying to use up the tension that had grabbed his muscles and made him clench his teeth.

Then he was on a small platform at the top. Zylyphony and Clave were dots. It was a long way down, a quicker suicide, he thought, than banging your head against a wall. But not for him, never for him. One thing that Rattrack never feared was his own death. He did not believe in it. A breeze could have blown him from the tiny perch, but there was no breeze in the city. He looked around, and even from this height, even with the light from the fountain, he could not see the flat level edges of the rooftops. He followed the marching lines of black windows with his eyes until they seemed to merge somewhere over-

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head with the black walls of the buildings. He looked higher still, until the buildings blended in with the black sky and the unseen dome. He looked up until he stood like an arrow perched on end, his mouth pulled open by the stretch of skin over his jaws, and for the first and only time, he felt small. The weight of insignificance fell on him like a physical thing and he dropped to one knee, trembling hands curled around the edges of his tiny platform. He saw a dead woman with a bloody head. He came up slowly, first placing his feet and straightening his knees, then uncoiling along his spine, raising his chin again. He took the collar of his tunic in both hands and ripped it open from sternum to navel.

"It's Rattrack!" he screamed. "Open your lights or huddle in the dark. It's Rattrack!"

The city answered him with silence.

"Enough," he said, his voice cold and loud enough for only himself to hear. "I know you. I know what you can do to people. I know the sad smiles of your dayfolk when they try to forget that they have nowhere new to go. I know their desperate chatter, their endless games. I know the triviality of your imagination.

"I tried to leave you and there was nowhere to go. For that you have taken me from the day. Now I say to you that I will not be devoured. There is a woman down there to whom you owe a soul. It's time you began to pay your debts."

He scrambled down the chute, friction searing the heels of his hands. He skidded around the widening turns of the spiral, down, down, the floor of the city growing in his eyes. He jumped the last four meters and walked toward Zylyphony. Clave rode up to him and then stopped, watching with rabbit eyes as Rattrack walked past.

He took Zylyphony by the rough sleeve of her tunic and pulled her to her feet. She came up limply.

"I ask you for the last time," he said. "Must you let the city do this to you? Can you allow it?"

She did not look at him even now. "You don't understand," she said. "Who are we to allow or not allow? If we didn't exist, the city would go on just as it always has with all these buildings empty, the streets quiet. It makes no difference. I stay alive because it's easier than dying. I come with you because. . . who am I to say no? But it doesn't matter. The city is a machine and to be human is nothing special."

Clave charged up to them, sitting high in his chair. "*He's* special. He's—"

"Shut up, Clave." Rattrack did not turn his head. "I won't let the city have you," he said. "We make ourselves special by what we do." He smiled. "I intend to make you come alive, really alive, if it kills you."

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He pulled her by the arm and started up the street. Clave followed behind. They went back along their route, back until they were standing again on the steel avenue. Rattrack motioned Clave forward, pushed a switch on the chair. With Clave gripping the arms as if it were a wild beast, it sailed up the avenue with Rattrack and Zylyhony running behind.

It was faster than they and they lost sight of it in the darkness. They could hear it wheezing and chugging ahead of them for a time until it pulled out of earshot. Rattrack slowed his pace.

"What are you thinking about right now?" he asked. This was the best sort of light for her. It softened her face, made her look close.

"I was wondering what it is."

"What?"

"I'm not curious," she said. "No, I just thought it might be easier if you told me what you really want from me. If it's sex, you can have it. If you want talk, I'll talk."

"What I want." As if it was small enough to be made into words. As if he could just say it and be done. "Just a couple of little things. I want to prove that everything you say is wrong. I want to make the city, the whole scuddy damned city, look up and say my name! Think you can take care of it right now, or would you prefer to wait a bit?"

The chair was hovering above a wide hold in the middle of the street where there had been no hole or seam minutes before. "What *is* this thing, Rattrack?" Clave said. "It—The chair came and—Everything feels different and I'm scared."

"It's all right," he said. "The chair homes in on this spot when you close that switch. It's for the Trollers."

Clave twisted around in the seat, looking down the street in a paroxysm of terror. Rattrack and Zylyphony walked to the edge of the hole. It was a cylindrical shaft running straight down into the body of the city, seven meters around and darker than the night. Zylyphony shuddered and looked away, and this, obscurely, seemed to him just right.

"Such a deeply dark place, Rattrack," said Clave, making a ludicrous attempt at self-control. "What is it? Where does it go?"

"Ah Clave," he said histrionically, "it's the place of the dead, the last journey of our departed nightlife fellows. This is the true shrine where Trollers make their grisly offering to—" He snorted at himself, failed a grin. There was a demand for drama in the air, a time, a tempo of events, and it would not do to just start down, pulling her after like a sack of stones.

He stood by the hole, waited for the upbeat. "Will you come?" he said finally.

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She shuddered again and shrugged, but when he swung his legs over the edge and lowered himself until only his head showed above the street, she sat down beside him and prepared to follow.

Clave called out, "I'd come too, Rattrack. I'd like to come but I don't think my body will move. No, it's all fuddy tight. I don't think I can move at all."

"Stay if you want," Rattrack said, "but it's safe. That chair has been down here before. This is where I hid it from the Trollers."

"That's fine," Clave said desperately. "It's safe. I'll putter-put along with you just as soon as I can move."

* * *

A spiral ledge ran clockwise down the wall of the shaft. Although it was not quite wide enough to safely walk along, it could be used as a ladder, each "rung" nicely spaced half a meter below the next. Rattrack started down with Zylyphony at his left, matching him step for step. They had descended about a hundred meters when they heard a sound above them. It was Clave's chair slowly moving into position above the hole.

Rattrack smiled and felt more at ease with the sound of the chair near.

The other time he had come here, Rattrack had been in the chair and had hardly noticed the length of the journey. Now it seemed to have no end. He climbed until his arms and legs, already tired from the fountain tower, began to twitch and then spasm. He made himself go a little farther, thinking each step, not allowing the illusory colors of the dark to distract him. He went on until he could not, and then called for a rest.

They sat on the ledge, the level above brushing their heads. Rattrack did not try to speak. He breathed, leaned back, tried to accommodate himself to the condition of being unable to tell if his eyelids were open or closed. He heard the grumble of Clave's machine, hollow and echoing above them, and. . . something else. He reached out to hold Zylyphony motionless. "Do you hear something?"

"I don't—"

He squeezed her arm. "Shush." There it was again, a whizzing sound, something like a ball bearing rolling down a ramp at great speed.

"I hear it," Zylyphony said.

It was very faint but growing louder, and there was a modulation to the volume. It was loud then soft, loud then soft, taking about a second to complete each cycle, as if it were something moving very fast, around and around. Where had he heard that sound before?

"It's a warden," Zylyphony said. She sounded . . . frightened? No, but her voice was alive. "There's a warden on the ledge."

For a moment he didn't under-

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stand. Then he twisted around to climbing position. He could not see the top of the shaft and the thing was coming up—how fast? By the sound of it, one level every second, thirty meters each minute. He stopped himself from trying to figure how long it would take them to reach the top.

He called up to Clave, "Stay away from the walls."

"Hands, then feet," Zylyphony said.

"What?"

"Listen." Her voice was close to his ear. "We hold on with only our hands while it passes by our feet. Then we balance on our feet and keep our hands away from the ledge until it's gone."

He could think of nothing else to do. They stood there, listening to the noise grow louder. It seemed to fill the shaft, each whoosh blending into the next. He heard Zylyphony expel a short breath. A giggle? Why didn't they try to hold onto the chair until it passed? The chair might have held them all. How would they know when it was on the level below them?

Then he felt the vibration as it passed beneath them, and they both yelled "Now!" simultaneously. A heartbeat while it seemed that his arms were stretching like rubber bands, and then "Now!" He planted his feet on the lower ledge, jerked his hands away. Too fast. His balance was uncertain. He began to pitch away from the wall, threw his left hand forward to grip the ledge as a picture of endless falling, his body revolving through the darkness, imprinted itself on his mind. He held the ledge.

A feather seemed to brush by his fingers. The pain came a second later and he screamed, pulled back reflexively and would have fallen if Zylyphony's hand had not pressed against his back, steadying him. He sobbed, his left hand held tight to his stomach, his right hand squeezing the ledge again and again.

Clave lowered his chair until he was level with them, nearly swatting them off the ledge in his haste. "A warden, Rattrack." His voice shook and broke. "A warden just went zippity by me not that far from my nose. Oh Rattrack, it's so fuddy dark—You're hurt!"

Rattrack moved his right hand along the ledge, unable to keep himself still for the pain. The surface was still warm from the warden's passing. His hand touched something small and soft. He felt it, rolling it between his thumb and forefinger, and then he realized what it was. He slid his hand along, felt two more. They were three fingertips neatly lined up on the ledge where the warden had cut them from his hand in passing. He swept them into the darkness, nearly losing his balance again.

"Let's go out, Rattrack," said Clave. "You can use the chair. Let's go—"

"Go?" The decision was already

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made. "When it did this to me?" His body spoke and felt pain, and none of it touched the perfect, cold certainty of him. The pustule had burst. This was only the beginning. "To me!" He slammed the wall with his good hand and started down. Without a word, as it should be, Clave and Zylyphony followed.

It was only five steps down, five awkward steps of hand and elbow, before they came to a blue light in the wall. Above it was an illuminated sign: AUTHORIZED PERSONNEL ONLY. He touched the spot of color and a section of the wall opened, large enough to admit the chair. They stepped from dark into light.

There was a floor and a thin glowing path, a meter wide, that ran into the distance like a dare. Rattrack had been here before. He sat cross-legged on the lighted path without a glance at his surroundings and began to massage his left hand, trying to work the weakness out of it. The hand would not make a fist. The fingers curled slightly and then stopped, trembling. They would move no further, no matter how strongly he urged the muscles. He looked at the hand, noticing how peculiar and square it seemed, not as if it were a part of him at all. The middle finger was cut between the top joint and the fingernail. The index and fourth fingers both had bits of nail still attached. He used his right hand to curl the fingers, and the pain hit again, worse than before. He doubled over, puking, and rocked back and forth, unable to open his eyes. He felt a hand on his shoulder. "Get away," he said. The acidic vomit in his throat made him cough. "Let me be." He needed some time, that's all, just some time.

Zylyphony stepped back, hugged herself and shivered. The air was much colder than the constant temperature of the city. She shook her head, walked a few paces away from Rattrack. She looked around. There was too much to think about and she was not ready.

The light of this place was bright only in contrast to the dark of the shaft. Now she could see the shadows, the limits of her field of vision. The place was immense. There were no walls she could see, no ceiling. The floor stretched away from her in every direction, a plain of metal broken only by a sparse maze of thin columns rising from floor to. . . where? Shadows in the distance, massive and indistinct, seemed to rise and fall like oily waves. She shut her eyes, stamped her foot to test the solidity of the floor. She was grabbed by a sudden abandon and she whirled around madly, joyously, then stopped just as suddenly, dizzy and cold, afraid. Just the chill, she told herself.

She looked back and saw the shaft by which they had descended, a shiny cylinder running from the floor to. . . how far? Distances were impossible in this place. That

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column over there, for example. She judged it to be no more than fifteen meters away, and she walked toward it, counting her steps. One hundred paces later she was about to give up, deciding that the thing must be moving away from her. And then she came to it with a sudden and absolute abridgment of distance. It was thinner than her smallest finger. She would not have seen it had it not thrown the light from the path directly back at her. She leaned her cheek against it and looked up. How far? She imagined, wanted to believe, that it ran up through the street of the city into the soft warmth of an apartment where someone slept, dreaming of the sun. She touched it with the tip of her tongue, feeling the tingle of metal at the back of her hose. A sound traveled through the column, the faint thrumming of heavy machines. She pushed away from it and began to retrace her steps.

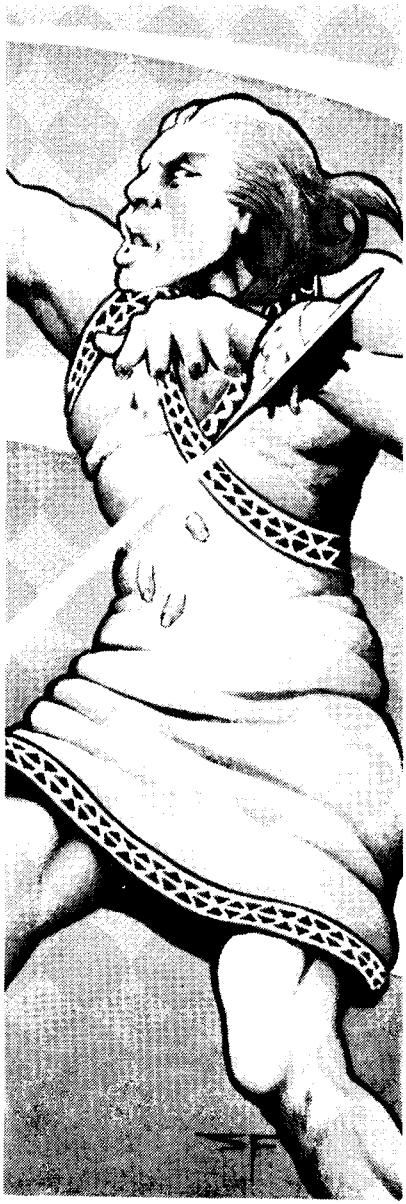
Clave rode up to her as she walked. "How is he?" she said.

"He hurts fuddy bad. He wanted to know where you were."

"I'm coming."

Clave turned, then swung the chair around again. His fingers trembled at the controls, and the chair shuffled back and forth in the air. A pause, then he said, "It happened because of *you*. He's only here because of you."

She retreated a step from the intensity of his pain, his anger, and his fear. "I don't want any of



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this," she said. "I'm only here because—No, wait!" She walked toward him. "I'm sorry, Clave, but I'm not responsible. I only want to be left alone. I just want a place that's warm and quiet. I want—No, this is all wrong." She folded her arms over her head, felt as if she were stretched paper-thin along the cold endless floor. "I don't know," she whispered. "I don't know anything except—Clave?" He was waiting, motionless, a sphinx. "I want to live. When that warden. . . I want to live! It's fuddy dumb, but I didn't know that before."

He scratched his ear. "Something is different with you."

"I'll ask him to go back," she said, "for you. You love him, don't you?"

The chair did its curious shuffle again. "I don't know," and he sped off to hover around Rattrack like a distraught mother.

Zylyphony watched him go. He was right; she had changed. She put her hand to her face. The flesh of her cheek was still cold from the touch of the metal column. Her palm warmed the spot. To live again, to want. She had changed and felt a bit afraid of how little she knew of what she had become.

Rattrack walked toward her as she approached the path. He looked pale, even in that dim light, but seemed composed. "We should stay on the lighted path," he said. "Things move around out here."

"You don't have to go on," she said, "not if you came down here to prove something to me. I don't think I need it anymore. You can go back now."

Rattrack laughed the laugh of a confused man. "Well, there was that, of course," he said. "Wanting to prove something to you, I suppose. But now. . . As long as we're here, we might as well look around. Why not?"

"Because you're hurt and you're weak, and this place may be dangerous. Wait until you're well."

"What's happened to you? I feel fine."

"Rattrack," said Clave, "it's a dubby bad place and it makes me shake all over. Let's go—"

"Shut up, you." He took a step toward the chair and Clave raced away with a look of terror. Rattrack turned back to her. He would not meet her eyes. "It's not just you," he said.

"What else?"

"This!" He raised his maimed hand and shook it. "This scuddy damned city took my hand. I'll take something from it before I go. I'll show it Rattrack. I'll teach Rattrack to it. Then I'll go back. Is that answer enough? Will it do? Come, Clave." He strode off toward the lighted path.

She watched him go, then looked toward the metal chute, the pathway back. She didn't know what to expect from herself. She was a stranger in her own skin. She heard

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the sound of Clave's chair and turned. He was looking at her, apologetic, perhaps hopeful. She managed a smile. "There's nothing back there anyway," she said. "In a way he's right. Why not go on?"

They went on together, and did not hurry to catch Rattrack.

She was thankful for the familiar sound of the chair. She saw nothing more ominous than that vaporous shifting of shadows in the distance, but everything looked as if it were underwater, so tenuous was the light and so indistinct were the shapes. Nothing seemed quite real or substantial except the sound of the chair and the stark ribbon of the path, as if there were no floor, as if she could step off the edge and fall lazily forever. She stopped trying to grasp the scale of this place, and realized after a time that she had settled on a false but comforting notion that it was really very small, that the darkness was walls, that those vague peripheral movements came from the rustling of a thin paper backdrop just a few steps away on either side.

She smiled. Clave, by her side, was repeating a baby rhyme to himself, a crèche song that she remembered from her own childhood. It went: *Go to sleep, child, close your eyes. Tomorrow morning the sun will rise.* Strange that memory could be so painless. The rhyme reminded her of another snatch of verse, the last lines of a poem she had never loved, but which came to her now. *Fear not shadows of the night. Dark is prologue to the light.*

Clave said, "When I was in the crèche, they said I was the bad one. The habilitators said so, the other children said so. They said, you're the bad one. You're the one the nightlife's going to get. And they were right. I couldn't do anything. I wasn't an artist, or a nurse, or a thinker. I was too stupid to be a hydroponics duddy. I didn't like the games or the shouting house. Oh, I was fuddy bad. All I could do was watch and listen. It took twenty-five years, but the nightlife did get me, it did. . . ."

* * *

The child is angry, pouting, defiant. "I won't go," he says. His back is against the wall and his pudgy little hands are fists. "I don't want to go."

The habilitator nods, looks at Zylyphony with a shrug and at the other strollers who have stopped to gawk. "Oh my, no," the habilitator says with exaggerated clarity. "If you don't want to go, of course we won't. The very idea!" She smiles tolerantly for the crowd.

"I want to go back," the boy protests.

"Well, we can't quite do *that*," she says. "Of course if you don't want to go to the shouting house, we won't, but it's what we are scheduled to do, you see. If we don't do what we are scheduled to

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do, then there is no schedule and we can't do anything at all. I'm sure you can understand. So you have a choice, you see. We can go to the shouting house or we can do nothing."

The crowd is growing thicker. Someone jostles Zylyphony, makes the sign of apology and moves away. She doesn't mind. She is quite taken with this little drama, very nearly genuinely interested. Besides, the sun is bright. Lunch was good. This feels to be one of her good days.

The habilitator waits patiently while the boy looks around the circle of faces, until his shoulders slump and he walks away from the wall. "Ready to go now?" she says. "*Want* to?" He nods, head hanging. "Very well, as long as you want to." Then, as they push their way through the crowd, "You had better be careful, young man. It'll be the nightlife for you if you go on this way."

The crowd chuckles its appreciation and begins to break, everyone talking to his or her neighbor, serious or delighted with the episode. Zylyphony exchanges pleasantries with a woman who is intrigued by the metaphysical subdual implicit in the nightlife concept. ". . .perfection, of course, being the obverse of the entire gestalt. . . ."

And yes, Zylyphony can see the point, that the nightlife fiction serves to point out the perfection of the city. And of course it is absurd to consider it on any other level. It is the ancient Hell myth revamped, given substance by the people who invent stories of their experiences as Trollers, and by the tales about people who disappear at night. If only (and she shudders a bit at the thought), if only it were true. If only she could spend a single night away from this damned perfection.

Anything to pass the time.

* * *

"What?" she said.

Clave looked at her. "I stopped eating the chew," he said. "I found out about it and stopped zippity quick. Then one night the Trollers came for me and dropped me in the street. They didn't even tell me where the hidy-hole was. Rattrack saved me." He leaned toward her. "You don't think I'm still a bad one, do you?" He studied her eyes. "No, you don't," he said finally. "How could you? You're here. You must be one too." He sat back with a sigh of satisfaction.

"Yes, Clave," she said, not really speaking to him. "I'm a bad one all right. I stopped talking with people, and that's bad enough, to the city."

"Oh, I never talked with anyone," said Clave. "I said a lot of things, but no one said anything back to me."

"What was it that you found out about the chew?"

His voice dropped to a conspirato-

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rial whisper. "It's not a food," he said. "It's really a little machine. It gets inside of you and changes your belly into a machine and makes all your veins into wires. It makes your brain a machine." He looked away from her. "You don't believe me."

"I believe you," she said. "It's true enough."

She saw the movement in the corner of her eye. It was almost overhead, a tiny black square dropping from the ceiling (not the real ceiling, of course, but as high as she could see), sliding down on nothing, or perhaps she could see just a hint of silver thread at each corner. Yes, now that it was a bit closer and larger, she could definitely see threads at each corner. Still, it was small enough to block out with her thumb held at arm's length from her eye. A little closer now. It was a cube, and there was something familiar. . . .

And then her careful little scheme of perspective exploded as she realized how huge, how impossibly vast, it was. The silver threads were four metal columns, and the cube, the black cube—She closed her eyes, sat down on the path. The cube was a building, one of the tall dwellings from the city's surface, all the windows opaque so the dayfolk would not be bothered with the workings of their home. As if they would care. As if there was one who would not call it a chew dream and go back to bed.

She opened her eyes. It had come to rest on the floor some interminable distance away without a sound, the roof still invisible in the darkness of height. It began to move at an angle away from her, riding between the four thin metal columns, gradually picking up speed until it was gone. She buried her head in her arms.

She heard footsteps. "I have to go back," she said. "I have to go back. I have to—" She made herself stop.

"Caught you by surprise?" Rattrack was sitting by her side. "It took me a while to get used to it too." He was smiling.

"I wouldn't mind," she said, "if we were going somewhere. It would be all right if we were going to find a place where people said things that mattered, or where the city wasn't—It's just too much. This place goes on forever and it's too big to be real. I want to go back and not think about it any more."

"So that's what you'll do?" he said. "Go back to the nightlife and the nipples on the wall of the hidyhole at mealtime? If the city would let you, you'd go back all the way, wouldn't you? Back to the hours spent admiring some silly small change in something unimportant, back to the games played with the object of not winning because winning would mean the end of the game. Remember? Remember that livingroom furniture they call art? Remember the solipsistic absurdities they call thinking?"

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"I remember, I remember, I remember! Will you stop it? Please, just stop." She felt tired and cold and thought that she could wait right there, motionless, just waiting for time to take it all away. "I don't know," she said at last. "The city won't take me back and this is no worse than the nightlife, I suppose. Maybe—"

"What?"

Something, a touch of life, crept back into her. A sneaky thing, this wanting. "Maybe there'll be something down here. People. A new life. I don't know." And it was gone again. "What does it matter? We're all walking dead."

"Oh, I don't feel so dead," Rattrack said. "My hand aches a little, but that's the worst of it. Besides, you and I at least have something to look for, you for your paradise and I—Well, let's say that I have a debt to repay."

"Your hand?"

"No, it's an old debt, or you might call it a game." He held up the damaged hand, the peculiarly abridged fingers. "This was the last move, and now it's my turn."

"Your games lack an element of humor." She touched the hand. "Does it hurt very much?"

"Just enough to keep me awake. It reminds me that I'm alive."

She looked at him, really looked at him for the first time. There was nothing new to see; it was only her eyes that were different. "Is it so important to you to feel alive," she said wonderingly, "that you welcome pain, that you make a personal opponent of a machine?"

"If the city is only a machine, what does that make us?" He was still smiling.

Exactly. But she said nothing, only looked away. She started when his fingers touched her cheek, but she held down the surprise and fear, and reached out to touch him in return. His eyes held hers for a long moment, long enough for her to both want to hold him closer and want to pull away, long enough to taste the silence. Then, when she knew that he knew he had her, his eyes shifted to the side, he looked over his shoulder down the ribbon of light, and said, "We shouldn't waste time." He stood, turned so she could not see his face. "I'll go ahead to find the city—there'll be a meeting between us, I assure you of that—and you can come along to look for that paradise of yours."

Paradise. Was it fair to pin a name on hope? But the thing she felt most, the thing at the top of her mind, was relief.

He waited impatiently for her to stand.

"Do you ever wonder who you are?" she asked.

"No," he said flatly. They started along in silence. She hung back a pace so that their hands would not accidentally touch as they walked.

They came up to Clave a few minutes later. He was hovering by

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an elevator platform set in the floor. It was the same type as the ones in the city's buildings, a circle marked in black on the floor, half surrounded by a curving, chest-high wall. The lighted path looped around it and then continued on, straight as an arrow. Zylyphony and Rattrack stepped on together, and a sign flashed on the inside of the wall, the letters flickering dimly. They ignored it.

"I won't fit," Clave said.

The sign winked off and was replaced by another. Zylyphony barely had time to read: MAINTENANCE ATM AUTO—TUNE PER/MITTOR TO IDENT. FREQ. before this too was gone and three buttons had appeared in its place. "Going down," said Rattrack. He pressed the second button. The floor jerked. There was a groan of gears and cables, and slowly they began to sink beneath the works of the city.

"Follow us down, Clave, the way you did in the chute," Zylyphony said. Then he was gone, and almost immediately the elevator wheezed and trembled and came to a stop.

She was looking out into a narrow corridor bathed in a hush of light, dozens of smaller hallways branching off before it curved out of sight. She noticed the ceiling. How strange to see a ceiling so low. It would brush the top of her hair. She heard Clave's chair lowering and stepped out of the elevator to make room.

The floor seemed to drop a fraction of a centimeter under her feet. She tensed, half turned, then threw her arm in front of her eyes as light, painfully brilliant, shattered the comfortable near-dark. She heard a scream from Clave, began to grope her way back to the elevator, almost wishing she were blind rather than be struck by this. Her eyes felt like flames in her skull. Then she touched a wall and stumbled. The floor was cold against her palms and the light was with her, even with her eyes closed, rosy through her eyelids. Long seconds passed before it was no longer painful. She held her hands up, opened her eyes the least possible degree, and looked through eyelashes and between fingers.

Light covered the wall from floor to ceiling and stretched two meters wide. Thin lines in a rainbow of colors flickered, danced, shifted from place to place with electronic speed and precision. She forced her eyes fully open (it was bearable now) and took a step toward the thing. It was too much to take in all at once, a maze of shifting lines, a mad draftsman's nightmare. In the lower right-hand corner computer letters announced: CROSS SECTION FROM SURFACE ARTERIAL AND MAIN ACCESS TUBE (AXES X1-Y1-Z1). It was beginning to make some sense of a bizarre sort. The shapes near the top looked like buildings that lined the steel avenue. Here was the hydroponics palace, the famous

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rooftop arcade outlined in orange. This must be the game house—no, it was the shouting house. The game house was over here, the black pentagon.

Rattrack and Clave came over.

"It's the city," she said. She pointed out the landmarks.

Rattrack nodded, pointed. "This is the shaft we came down." It was labeled MAIN ACCESS TUBE.

"What do you think these. . . . ?" With her finger she traced a group of thin green lines that ran a tortuous course from the top of the screen to the very bottom.

He shrugged. "Com lines? Transport tubes? Circuits? Connections?" He stepped forward, pressed his palm against the screen. "This can tell us everything," he said. "It can tell us where the city is exposed, what to manipulate, how to get away. It can—" He stopped. There was a hum in the air.

"Wardens," said Zylyphony. She glanced at the map. "This is the maintenance level. This is their home." And they all heard, not the hum of a single warden, but the low pitched growl of a dozen, or two dozen, or more of the small machines.

"The elevator," Rattrack said. He took one step in that direction, and a warden zipped from behind the curved wall of the elevator. He barely had time to jump to one side. It ran out of sight around the bend of the corridor, slowing in preparation for a turn as it went, and just as it disappeared, a pack of perhaps five more came around the bend, bearing down on them at terrifying speed.

"Rattrack," Zylyphony yelled, "the chair. Get up on the chair. Get your feet off the floor!" She was moving before the words were out of her mouth. She grabbed the back of the chair and hauled herself up, dangling for a moment and then wrapping her legs around the armrests. The chair groaned.

Rattrack seemed frozen for a second, then scrambled up onto Clave's lap. In that instant the map screen went black and the buzz of the wardens passed under them in the dark.

Zylyphony pounded her fist on Clave's shoulder. "Power, Clave." She could not see anything in the sudden darkness, but she could feel the sensation as they floated gently toward the floor. The chair shivered and whined as it tried to compensate for the excess weight. "Power," she said. A snippet of a popular tune played in her head insanely for a moment, then was gone. "Power!" Clave's shoulder was like a rock; he did not move. She stretched her hand toward the controls. Her position was nightmarishly wrong; the levers were a fingertip's width from her reach. She began to adjust to the sudden darkness, saw the chair drifting down, saw the swarm of wardens beneath them churning like a hive

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of disturbed bees. Then Rattrack cursed, twisted to get his good hand to the proper lever, and pulled. The chair screeched a protest. It shook as if it were about to fly apart. But it held, began to rise, then steadied as Rattrack pushed the lever back a bit. It fell no further.

"The elevator," Zylyphony said, shouting to be heard above the piercing machine noise of warden and chair. "Move it back to the elevator."

Rattrack's eyes were wide and wild. His face was twisted with desperate indecision, his lips pulled back, his teeth bared. "No, the map. We need the map!"

Zylyphony pulled at the back of the chair, felt the muscles in her neck and belly lock. She forced her way up, then forward, the back of the chair biting into her ribs. She caught a glimpse of a warden passing over her head on the low ceiling. She reached for the controls.

Rattrack slapped her hand away.

"Listen, Rattrack." She made her voice calm. "The map goes on when someone stands on the floor. Do you understand? The floor. Look where you'll have to stand."

More wardens were piling into the corridor each second, nearly blanketing the floor. A few zipped along the wall in a brief arc before disappearing into the roiling mass. Zylyphony felt the heat rising, saw Rattrack look down.

Then they were blinded again as the map screen flashed on.

Zylyphony forced herself to look. It was not so painful this time. Rattrack was already squinting at the map.

"Reactor," he said. "See how the lines converge at that one spot?"

She tried to think. The buzz of the wardens cut through her. She stared at the map. There were four distinct levels to the city, top to bottom, from the surface to a level below this one. "That's it," Rattrack said. And yes, she could see the spot on the next level down where all the lines, green, red, yellow, blue, all came together. It was a dome shape nestled at the base of the main access tube, their shaft from the surface. Red letters across the dome said: REACTOR COMPLEX/CENTRAL COMP. Did it mean something? She was dissolving in the heat.

The pitch of the chair changed, became more insistently erratic. "The elevator, Rattrack. Now!"

He nodded. He moved his hands. The chair jerked.

"Back," she said. "A little to the right. Farther. There." The wardens ringed the entrance to the elevator, but did not enter. Signs flashed on the curved wall, the buttons appeared, and she flung her hand at them, not caring which one she hit. The elevator creaked and jerked, and began its slow descent. For a second her eyes were level with the gleaming hump-backed bodies of the wardens. Then they

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were gone.

The elevator rumbled its way along its track, groaning as if it were the grandfather of all machines. It moved much more slowly than any reasonable design could have called for, stopping completely at times and then starting up again after a hesitation of clanking gears. Clave's chair was a new thing in bad repair, but this elevator was old. It felt old. It made Zylyphony feel that they were dropping down through time rather than space. She listened to the squeaks and clunks as if they were the answer to a riddle. Why am I here? *Clank, wheeze—I don't know.* Where am I going? I don't know.

Rattrack lowered the chair to the floor and smiled brightly at Zylyphony. "What a battle," he said. "What an adventure. We'll take the city and twist it by its nose." The elevator lurched and then continued down. He laughed and kicked the wall. The elevator rocked. "Our chariot."

Clave essayed a grin. Rattrack leaned over, grabbing his tunic when he tried to twist away. "You duddy little fool," he said. "You frightened idiot. You could have killed us, freezing up like that." He slapped Clave across the mouth.

Zylyphony pushed them apart, then hit Rattrack on the nose when he reached again for Clave. "You're no better than he is," she said. "Get over there away from him. Go on. Go!"

He turned and sat facing the wall. "Just keep that," motioning at Clave, "away from me."

She put her hand on Clave's shoulder, saw the tears on his cheeks. They sat that way, listening to the sounds of the ancient machine down through layers of the city and minutes of their lives.

"I'm sorry," Rattrack said. They were both silent. "Look, I don't apologize often, but I said it. What more do you want?" The elevator shuddered, then went on. "I can't afford to be soft," he said. "Look into your miserable souls and you'll see that I'm doing this for all of us. I'm doing it for you."

"Be so fuddy careful, Rattrack," Clave said, his voice soft as spun cotton. Zylyphony looked at him in complete surprise. "Be so fuddy careful that you know who's soul needs your help."

The elevator stopped.

There was a door and a silver knob set halfway up one side. Rattrack pushed at it, then pulled. Nothing. He tried to slide it to the left and the right. "It's locked." He kicked it.

Zylyphony walked over and pressed her hands against the door, fingers curved, palms arched, like two clumsy spiders. She rested her right hand on the knob. It was warm from Rattrack's grip. It seemed loose. She curled her thumb and forefinger around it.

"No!" It was Clave, standing on the seat of the chair. He thrust his

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scrawny arm toward her, palm up. "Don't. . . ."

"Can it be any worse than the nightlife?" she said.

"Yes!"

She looked at the knob. It almost seemed that it wanted to turn. "I have to see, Clave. How can we know unless we look? How can we know that it's not—" Paradise. But she couldn't say it.

* * *

She turned the knob and the door swung out without resistance.

Foul air wafted into the elevator. Zylyphony stepped through the door, into the smells of decay, the pungent odor of urine and feces, the silence. She stood on a city street.

A former city. The street was cracked. Many of the walls lining the broken sidewalks had crumbled and fallen into brash. An odd sort of lighting, like firelight, flickered on the ruins, danced with the shadows. There, a roof had toppled nearly intact onto the rubble, flecks of blue and gold still clinging to the material. There, an entire building facade stood, straight as if it were built yesterday, but the twisting light showed no side walls, no back, no roof through the empty window. It had been a low and spacious city once, with four- and five-story buildings and wide courtyards. Now the buildings were gutted or down, the courtyards were

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fragments of loose concrete, and the people—

Clave chugged out of the elevator. "It's so empty," he said in a whisper.

Rattrack was by her side, apparently struck as dumb as she. He cleared his throat. "The reactor complex should be straight ahead if the map. . ." Zylyphony looked at him. "We can't stop now," he said. "We can't be sure that it's all like this." Zylyphony said nothing. He went two steps ahead, stopped, looked back. He smiled. "Won't you come with me? We've come so far. I just want to look a little farther on."

"It's over," she said. "There's nothing here. It's time to go back." She tried to return his smile, tried to sound more sincere than she felt. "We can go back together."

His smile faltered. He looked to her left. "Clave?"

Zylyphony saw a motion from the ruins as she turned, just the shadows jumping. She saw Clave in his chair, his face for once saying nothing. He slipped out of the seat and stood on the ground by her side. "The chair's yours, Rattrack," he said. "Thank you for it, but I don't think I want it any more."

Rattrack wet his lips with his tongue. "Well," he said. He looked up the broken street, back at them. "Well then." Zylyphony saw another movement, was suddenly edgy. The shadows? She looked up the street at the thin fluttering light. Where did it come from? Then Rattrack's good hand tightened in a fist and he said, "Well then, damn you. Damn you all." He started up the street.

A cackling laugh burst from the shadows. Clave screamed and leaped for the chair. Zylyphony spun around. And they came.

She could not count their number, it happened too fast. They came out of the shadows all at once. A few carried torches. Others were hunched, naked shapes on the fringes of light. Clave had vanished. She saw Rattrack, a circle of bodies closing around him. Then they were on her.

Everything was blurred motion and fragments. Grunts and squeals sounded from all directions. A hand gripped her arm and she shook it off. A face passed in front of her and she saw it like a snapshot, red hair and eyes like ruby marbles, bone-white skin, lips split down the middle by a terrible fissure. She kicked out at a motion, barely connected, but something went sprawling across the asphalt. She pushed a hand from her shoulder; the fingers were fused together in a single lump.

She was pushed and she fell. She saw a spear, a leg bone filed to a point. Huge hands clamped her arms to her sides, lifted her from the ground. She saw Rattrack go down under the tumult of bodies, and she screamed, "Rattrack!"

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She heard her captor's voice, loud and deep. "Rackpleck," it said. Its breath was thick and putrid. Her stomach heaved. "Rackpleck," she heard, "Rackpleck," the distorted word passing from mouth to mouth in growls and squeaks. "Rackpleck, Rackpleck, RackpleckRackpleck-Rackpleck," and they were carrying her down the street, running so that the torches dimmed, their heads of fire swept back by the wind. "RackpleckRackpleckRackpleck," until her brain no longer accepted the sound, no longer translated what she saw into meaning. She knew nothing but the jolts and bumps, and even these seemed as far away as a memory.

The light brought her back to thinking again, a steady white light that slowly grew brighter. The only sounds were the footfalls of her captor and his wheezing with every step. Silence, after a fashion. She twisted around to see where she was being taken, and he casually punched her between the shoulder blades.

The light became so bright that her eyes watered, and then she was thrown down, bruising her elbow on the rough, broken flagstones of the courtyard. She crawled a few paces away on her hands and knees toward the hill of light, then stopped. Where was she going? Courtyard? The place smelled of urine and the stones were sticky. She sat up, tried to arrange the pictures in order, any sort of order.

Yes, it was a courtyard, a plaza of great cracked stones. The hill of light was a dome, a vast glowing arc, perfect and untouched in the middle of the ruined courtyard. The gleaming cylinder of the access shaft rose from its base to reach for the ceiling.

A sound, a footstep, and she whirled around on all fours. The huge creature took another step, and she backed away, dragging herself on her palms. The monster stopped. It was nearly two and a half meters tall, with blunt features, a cleft lip, skewed nostrils, and brilliant blue eyes. She pictured Rattrack walking up, slapping it on the thigh, saying in that proud cynical way, "Our chariot." A giggle escaped her lips. The monster stooped, sat on the stones with legs out straight, arms as braces behind its back. Her back? The bulges on that mountain of flesh could be breasts.

Suddenly he-she-it whipped its hands forward, clapped them once, and flung them back before it could lose balance. The mouth twisted, smiled. "Rackpleck," it said.

Rackpleck. Reactor Complex. Zylyphony began to laugh. She clutched her stomach, doubled over with hysterical, heaving sobs of laughter without knowing why, except for the coincidence of names.

Which was no reason. She stopped, ran her hands across the rough stone, waiting for the trembling to leave her. The giant had

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stood, was walking toward the access chute, its back to her. She looked over her shoulder at the dome and saw an inscription across its surface in dark letters, halfway up the side: THE CITIZENS ARE THE HEART OF THE CITY.

There was a group of infants and very young children at the base of the access tube, too distant for her to see any details other than an occasional flash of white skin. Others were coming into the courtyard now. A dwarf hobbled past on club feet, holding a white bone spear in one white hand and a torch in the other, the flickering flame-blossom dancing beside a thatch of red hair. A woman with no visible deformity other than a split lip went by looking tired and. . . young, in a badly worn sort of way. They all had that quality of ruined youth, ageless at first glance until the eye could separate the child eyes and smooth skin from the stoop and shuffle. And aside from this, and aside from the common deformities, the albinism, the dwarfism, the fused digits, the split lips, they all bore a look of sameness. It was a similarity of facial structure, a line of profile, that linked even her blue-eyed giant and the red-eyed, white-skinned dwarf, as if they were all somehow related, all of the same family.

Many of the women were pregnant, and some of these went to collect infants from the group by the access shaft. Zylyphony saw one woman clucking and repeatedly pressing a bundle to her breast, though it was motionless. She heard a scream of rage and saw a woman rush at the albino dwarf. He kept her at a distance with the point of his spear, chattering with fear and anger until she backed away, bleeding from a dozen pinpricks. One of the older men, eyes the same blue as her captor, came over to her and bent his head with curiosity. He reached a lumped hand toward her face, then pulled back when she flinched. "Nah hort," he said, and walked away. No hurt?

A group approached the courtyard sharing some heavy burden. They dropped it on the stones a short distance from Zylyphony and went on their way. It was Rattrack. She patted his face and he blinked awake, looked at her, at the milling crowd in the courtyard and by the access tube, at the dome.

"I've found it," he said.

Zylyphony heard a thud. A knot of people gathered around an opening at the base of the access tube and pulled out a limp bundle completely swathed in thin white bandages. The dwarf sliced through the covering with his spear, dug and hacked and finally came away with two fist-sized chunks of red meat. He handed one of them to a child on the floor and sat on his haunches a few steps away, gnawing hungrily at his prize. Others elbowed their way into the crowd, all pushing and clawing for a place by the corpse.

Her paradise.

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She felt Rattrack's hand groping for her arm, holding her as he pulled himself up. "What are they?" he said. His face was pale, his throat working as he swallowed. "What sort of creatures. . . ?"

By the corpse stood her personal giant, its mouth smeared with drying blood. It smiled at her. Then, with a sweep of one huge hand, it swept the others out of the way, picked up the mutilated bundle, and started toward her. The entire population followed, the ones who had not yet fed clawing frantically at the stained bandages held above their reach, and the others fanning out so that she and Rattrack found themselves with their backs against the dome.

Rattrack turned and hammered against the glowing curved wall with his fist. The surface absorbed the blows and even the sound of the blows as if he were hitting solid stone. Zylyphony was only tired. It was a supreme effort for her to lift her hand to his shoulder, to say, "It's all right."

He whirled around, staring at the approaching shapes as if she weren't there. "No," he howled at them. Then he ran at one woman in the semi-circle, kicked her feet from under her, punched her as she fell, and stood in challenge, waiting for the battle.

They all stopped. Some of them looked around in confusion. The group surrounding the giant had given up on their meal and simply waited sullenly. Not one of them looked directly at Rattrack or made a move in his direction. The woman he had felled whimpered and crawled away from his feet. He dropped his hands to his sides and the killing expression left his face.

The giant took a step toward Zylyphony. It smiled and threw the bundle to her feet. She closed her eyes. There was nothing left inside of her, no hope, no disgust, no pain, nothing but the faint and fleeting wish that she could bend down and take her share of this gift. She was hollow. She forced herself to look at the creature, to nod, to say through numb lips, "Thank you, but no. Nah." She shook her head.

"Nah?" It looked at her quizzically and took another step forward. She held our her hand to. . . what? To halt? To beckon? To ask for something that she could not have? And what did it matter?

A scream and a rumble shattered the quiet, and out of the shadows of the ruined buildings came Clave in his chair, shrieking so that even seeing him, Zylyphony was afraid. He passed above their heads, a sonic catastrophe of human lungs and tortured metal, then banked the chair high and came in for another pass. The assemblage vanished. Some ran while others hobbled or carried the infants, but they vanished and were gone into the ruins before Clave had come around. Her hand was still out when the machine landed between her and Rattrack.

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Clave jumped from the seat and stood there preening. Rattrack walked over and clapped him on the shoulder. "Fine work," he said. "Just in time."

Clave looked at her. She nearly turned away, but she saw the brightness of his eyes, his stance, and she said, "Yes, thank you, Clave. Just in time." He looked down. A bit of the air went out of him. Had she sounded so bad?

Rattrack motioned at the chair. "You've earned it now. It's yours."

Clave licked his lips, shook Rattrack's hand off his shoulder. He seemed acutely embarrassed, nearly stuttering as he said. "No, Rattrack. I don't want it. It isn't mine." He sat on an upcropping of stone with his back to them. "Just because you're looking so hard for something doesn't make you bigger than me," he said.

Without a word, his jaw working, Rattrack went to the remains of the corpse and lifted it, almost tenderly. He carried it toward the access chute. Zylyphony went with him. She had some idea of trying to explain, of stopping him, but words were too much. A restraining hand on his arm would be too much. She could only walk along and watch as he leaned through the opening in the side of the tall cylinder, pried away the makeshift platform of wood and metal scraps, and let them drop along with the body. Seconds later they heard a soft, distant splash.

Rattrack returned to the dome while she walked more slowly, passing by Clave as if in a dream. Rattrack was searching for an entrance when she reached him. He had found a short line of symbols on the glowing surface and was pressing them in various combinations, trying to pull at them, cajoling them beneath his breath.

The people were coming back to the courtyard, moving about at random, ignoring the visitors. A few went over to the access tube, looked through the opening, and began to murmur among themselves. Others wandered over and the murmur became a hubbub of angry chatter. There were glances at Clave and the empty chair. The dwarf and a few others began moving toward him. The crowd swelled as it approached.

Zylyphony took a step away from the dome. "Clave?" She had spoken too softly. She cleared her throat. "Clave!" Too loud. He jerked his head around. "Come over here."

He stood then and saw the ring of faces. They hesitated, and resumed their cautious advance. The dwarf ran forward, motioning with his spear, then skipped back into the pack. He ran out again, coming a little closer this time.

Clave backstepped. The crowd surged forward. He turned to run, tripped on the uneven surface, went down. There was a sound behind

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Zylyphony, a rush of cooler air. A wedge had slid open on the side of the dome. She saw Rattrack poised at the opening, a glimpse of intricate machinery and lights, like an electronic hive. Then Clave was gone, covered over by a swirl of bodies, kicking feet, descending fists. The dwarf danced about, played at plunging down the spear.

And Zylyphony was running, screaming, throwing herself into the sea of flesh. She fell on top of Clave. He was curled into a ball, his eyes closed. She was pulled away. The circle closed again. She saw Rattrack at the opening to the dome, his foot lifted to step inside, his face turned toward her, straining in two directions at once like an acrobat executing an awkward-seeming trick of balance.

Then he ran for the chair. The dome closed behind him. He was in the seat, up, speeding at them, the chair rumbling like the thunder of Armageddon.

Few ran this time. They cowered as the chair rushed over their heads, but stood their ground. The dwarf held the spear at his shoulder, cocked his arm. The chair banked, came around low, started back. The spear flew.

Rattrack brushed past Zylyphony and cut through the fringes of the group like a dull scythe. Bodies scattered like mowed grass. The rest fled now, some for the shadows, but most toward the access chute where they gathered to watch and

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wait. The chair came around for a third pass, came around, slowed, and stopped in the air by Zylyphony. Rattrack smiled. He leaned forward and looked surprised. His injured hand went to the spear in his side pinning him to the back of the chair. His other hand was on the controls, and when he slumped over, the chair sank to the floor.

Zylyphony dragged Clave to the chair, tugged and hefted until she had maneuvered the dead weight onto Rattrack's lap. She felt a burning at her eyes and throat, but tears and acceptance were equally impossible. She sat on the arm of the chair, legs dangling over the side, and started up. The controls were simple and she had seen them used often enough. The chair grumbled, bucked so that she had to hold onto Clave to keep them both from being thrown, and rose hesitant into the air. She rode toward the access shaft.

The chair was sluggish, and moved forward slowly. The giant stood at the head of the crowd by the chute. It stepped aside as she came up, no expression on that misshapen face, no sound from its mouth. Zylyphony looked straight ahead, feeling like a ghost as she drifted past. A path opened through the crowd as she went on, each face sliding by the periphery of her sight, those to her left lit by the dome, and the others cast in shadow. There was nothing grand in this escape, nothing sharpened by fine meaning or exultation. The faces passed, one by one, the red eyes, the blue eyes, the split mouths, each quiet and still and at their own sort of repose. Then the chair was in the chute, straining, vibrating, rising like a bubble in heavy oil until the smells were gone from the air and the light of the dome was far behind.

For a long time she heard nothing but Rattrack's labored, uneven breathing. She touched his brow once; it was cold and damp. She thought Clave might be dead, but did not have the strength or courage to see. Eventually, it seemed like hours but must have been no more than fifteen minutes, he stirred, groaned, began to shift around. She grabbed his arm.

"What. . . ?"

"Be careful," she said. "Rattrack's hurt. We're in the air."

He was quiet for a moment, then edged his way carefully from Rattrack's lap to the other arm of the chair. She heard him hiss with pain as he twisted around.

"Are you badly hurt?"

He was silent as if considering. "No, just shaky little pains."

Another moment, another meter toward the surface. Time and distance seemed interchangeable here.

"How's Rattrack?"

"Dying, I think." Silence. They passed a glowing blue spot on the wall, the entrance to the works level.

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"I didn't have to save you back there, did I?" he said. "They weren't bad. You wouldn't have been hurt."

"No."

Rattrack groaned, began to squirm. His breathing became heavier. She patted his cheek, felt him come awake.

"Zylyphony?"

"Yes."

He coughed. "Is Clave. . . ."

"I'm over here, Rattrack."

He relaxed. His breathing became more even. She thought he had fallen asleep and put her hand lightly on his shoulder. It was very dark. She wished she could see.

Suddenly he twisted around and pulled at the monstrous thorn in his side. He held the pose for perhaps ten seconds, endless seconds, then slumped back. "I can't. . . ." He struggled for breath. "Damn city! Scuddy damn. . . ."

She and Clave said nothing for the rest of the trip. The circle opened above them as they reached the underside of the street, and they came out into the dark city, the night city, the steel avenue, the black buildings, all terribly unchanged.

The two of them climbed from the chair. Clave turned back, stood on tiptoes to work the controls and maneuver the machine over the hole. He jiggled the lever and the chair began to drop with its burden, slowly, slowly, until it was gone.

"Maybe they'll catch it," he said. "It's going slinky slow." The street closed without a sound, without a mark. He sat crosslegged by the place and closed his eyes.

She wanted to sit with him. She wanted to never see him again. She walked away, stopped, walked a few steps farther. There was something on the side of a building, a patch of light that shouldn't be there. She went for a closer look.

* * *

It was an open door.

For the first time that night she found herself truly terrified. There was no reason for this door, no understanding it. The city never made mistakes. The city never forgave. These were rules of life. Rattrack had been wrong; the city was a thing, only a thing. She felt herself pulled forward and looked inside. There were none of the proper elements of horror here, no shadowy movements, no sudden sounds. It was a well-lit apartment-building corridor leading to an open lobby, plush and quiet, no one in sight. Faint lilting music came from the distance. It was horrible. She wanted no part of it and it sucked her in. She stepped over the threshold, expecting each second that the door would shut her out and the city would shake with laughter. But that was Rattrack's game. The city didn't care. It was impossible.

This was impossible.

She was inside. She stopped,

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standing a bit wobbly on the cushioned floor. She touched a wall and felt velvet. It was too much. The silence laced with music was too much. She turned. The door had closed. She flung herself against it, pounded with her fists. It would not open.

There were footsteps, light and muffled. She whirled around and saw a woman coming toward her, regally graceful, wearing a long shimmering blue gown. She pushed herself away from the door, surprised that her body did not tremble.

The woman stopped a few paces away, made the gesture of welcome, smiled. "It's so late," she said. "I could hardly believe it when I heard we had a new tenant, but here you are. Isn't it exciting? Isn't it wonderful? Such stories you'll have. I haven't been so excited in, in. . . well, I just don't know how long. How do you like your new house? It's a fine house, you'll see. All the fixtures were designed by Grata. . . ." and on and on, the games room, the conveniences, deafening inanities, monstrous inconsequentials all.

And to her horror, Zylyphony found herself smiling and replying in kind.

The woman in blue motioned. "Well come right along this way. Your room is just lovely. I think it's a blue one. Blue is such a lovely color, don't you think?" She laughed musically. "Now why are you crying, dear? Have a chew. It's going to be a lovely day."

* * *

Clave saw Zylyphony go inside, saw the door snap shut. He looked at the building, looked at the street by his side. He stood. He couldn't do anything. He wasn't good for anything but watching and listening. When he tried to do something, it came out all fuddy wrong, and he'd tried. He'd tried down in the old city when he felt different and went to save them, and it had come out wrong then. He was always the same. He was a bad one. He felt different still, but that must be wrong too.

He smoothed down his tunic. The sky was beginning to turn from charcoal to dark gray. There wasn't much time. He started down the street toward the northwest hidy-hole. It would be nearest.

A light flashed out of a side street and he froze. The Troller came around the corner, pinned him in the spotlight, and rode up.

"What have we here? A scuddy little rodent out after bedtime? Should I wrap you up, rodent? No, I think I'll follow right behind you all the way back to your hidy-hole, and maybe I'll let you make it and maybe I won't. Go on, little pest. It's a long walk and I might make up my mind any time."

The light wasn't so bad. He could look over it and see the out-

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lines of the man and the chair. Here was something fuddy strange: The chair was just a chair, and the man just a man.

"That's enough time," the Troller said. He swung the muzzle of the roper around. "Walk."

"I know a secret," said Clave. "I don't know much but I watch and I listen and I know two things. Do you want to hear?"

The finger hesitated above the trigger.

"It's bad when you don't know what something is. It's bad when you think it's something only it's not. It sounds funny but listen. I know what people are, and I know what people aren't. That's the two things. Oh, it's so fuddy easy." He touched his chest and spoke very slowly and clearly. "I am a person." He pointed past the light. "You are a person. All of them," sweeping his hand in a great arc, "are people." He was delighted with himself. He was going to get it right!

"But here's the other half of the trick," he said. He walked up and patted the chair. "This isn't people, it's too hard." He leaned down to pat the satin street. "And this isn't people, it's too straight." He looked up into the light, smiling. "Try it," he said. "It's easy. There's oh so much that isn't people, and there's oh so much that is."

The Troller was motionless. Finally he whispered, "If I don't take

you, someone else will." He tightened his grip on the trigger, then drew back. "Get on to the hidy-hole," he said. "Get on now." He spun the chair around and raced off.

Clave watched him go, then looked up at the graying city dome. The city was still fuddy dark, and quieter now between times than in the middle of the night. He felt sad, sad and fine all at once. He couldn't understand it, but there it was, and he started down the street, the hard plastic soles of his shoes slapping (another Troller called off to someone in the distance), slapping the long steel avenue of the city at dawn. ★

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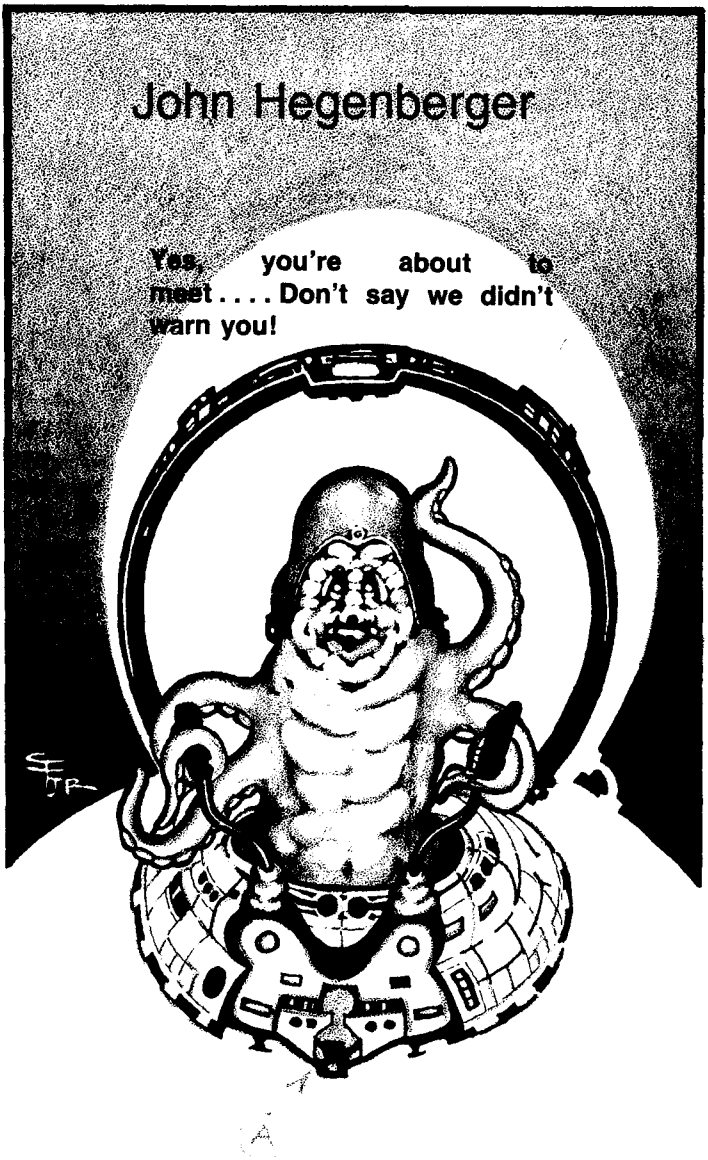
LAST CONTACT



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ON A CLEAR November night in 1974, a three-minute message from the entire human race was transmitted from the radio-telescopic installation at Arecibo, Puerto Rico. At this very moment, that message continues to pierce the Universe at near light speed. Who knows its content or consequences?

* * *

Snorflapp plied his ship between the stars, whistling a gay and snappy tune. He had good reason to be happy; the gods were on his side, the odds in his favor. As Snorflapp watched the blue and white body, third major mass of a yellow star grow in his simuvisor, he marveled at his good fortune: It was certain that the signals had originated from this close-at-tip source. Twining a gray, middle-aged tentacle around the computer's gripper, Snorflapp initiated a detailed canvassing of the planet's physical parameters.

He knew he had the jump on his competitors. According to the well-known sociological axiom: "An isolated society that has recently become capable of radiating energy along the hydrogen band is a society eager for plasma-form fusion." The inhabitants of this world would, in all probability, be dying to find a controllable form of fusion energy. If Snorflapp completed one more sale, his alimony would be canceled forever; sufficient excuse for musical delight. But his whistling had a further purpose: Snorflapp was nervous.

The present situation was disturbingly similar to his first contact mission, many years ago. The circumstances had been ordinary enough then too: a standard signal received, a standard reply returned: "Thank you for your kind interest. Unfortunately, due to relativistic wrinkles, I am unable to arrive at this time. However, a quick glance at my schedule shows that I will be in your area very soon. Perhaps then we can get together and compare life forms. Looking forward to our meeting, Snorflapp Candruthers."

How exhilarated he had been! How anticipatory! And then the inhabitants had obliterated themselves before Snorflapp could arrive. He had tried not to take it personally.

Waiting for the canvasser's report, Snorflapp resolved that this time there would be no mash-ups. His ship was equipped with the very latest concept translators. He could penetrate the Communication Barrier with little or no malapropism. His static shield was guaranteed to protect him, should the natives prove to be anything less than civilized. And, of course, the usual social quirks were to be expected—taboos against the public passage of gastric gases, for example—but Snorflapp, like all contact-agents, was a graduate of the Leinster School, albeit a late one. He was,

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therefore, mentally limber, capable of absorbing most forms of cultural shock, and adept at avoiding dealing out any of his own. Unfortunately, there was no guarantee, shield, or method that completely obviated most embracing of all interphase problems: Terrified natives.

Past contact missions had only been able to discover cultures that were far less civilized than Snorflapp's; and more than half of these had quickly fallen victim to mass panic and consequent social disruption. Suspicion was a Contactor's primary enemy, but it was also his greatest friend: it separated the conscientious agent from the fumbler, the clever from the dull, the quick from the dead. It put zing in the profession and made space taste tangy.

Snorflapp resumed his whistling and scanned the concluding report on the planet's conditions. The gravity was acceptable. The atmospheric pressure and toxicity at surface: Correctable. Unclassified organisms at selected site: Three hundred and fourteen. Hazardous bio-organisms at selected site: Unknown. Total Survival Factor: +730.

Not bad, Snorflapp thought. He prepared for the impact of descent. If all goes well, I'll be home in time to catch the last half of the third mating cycle. Won't Grizzleguts be surprised?

Occupied with memories of amorous triumphs, Snorflapp fortified his psyche while the ship gravitated through the spinning planet's soft, silky shell. Directional controls had located the signal's origin site, a tiny landmass nestled below a jagged continent. Grumbling dully, kicking up gusts of grit and dust, the ship settled into a crater of remarkably regular dimensions.

* * *

Snorflapp twisted his posterior tentacles, anxiously watching the exterior screens. There were neither weapons nor welcome. Perhaps the inhabitants had gone mad and killed one another after having received a reply to their message. Snorflapp shuddered. That was silly. Such a thing couldn't happen to him twice; nobody's luck was *that* abominable. Probably the natives were just hiding, waiting for him to show his colors. A common enough reaction.

Snorflapp waited. The coolant system frosted his craft's outer hull, causing an occasional *ping*.

A triangular series of cables, which formerly had spanned the crater and been tautly attached to a rim-encircling network of towers, was now snarled and tangled in the ship's projections. A heavy, metallic artifact lay at an angle, not far away, half-buried in the crater's gentle slope. Both the cable and the artifact begged intelligent constructors, but none were in evidence. Snorflapp sighed, his anxiety in-

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creasing. They were making it tough for him; he would have to leave the ship.

Then, at the crater's crest, a brightly colored artifact came into view, descending slowly around a spiral path toward Snorflapp. It wound its way down the crater, trailing a wake of white and brown exhaust, gradually nearing. When at last it arrived, a tiny, oddly shaped organism emerged and proceeded to toss bits of surface matter against the chilled hull. This added to the rippling tattoo.

Snorflapp peered with interest at the image on his screens. The creature was biped, the size of a newborn child. It clutched a fuming object in its—according to the ship's analysis—mouth. Hopefully, the wisps of smoke had little relevance to the org's mode of communication. They would be hard to mimic.

The concept translator quickly scanned the local, low-level electromagnetic waves, seeking a matrix of symbols compatible with the bipeder's physiology and/or intelligence. Slowly, with great enunciation, Snorflapp said, "Salutations," and watched the screen while the ship translated the concept into the inhabitant's language.

"*Buenos dias,*" the outer speaker bellowed. The sound was perplexing, yet faintly pleasant. Snorflapp hoped the bipeder found its meaning clear and its tone appealing. "My name is Snorflapp Candruthers. I am from the planetary mass existing beyond—how do you say it—Tau Ceti?"

The bipeder made no move. Apparently, it knew no fear.

"I bring you peace and good will," Snorflapp continued. "I know that my words are difficult to comprehend. Please try. What is this place known as?"

"*Esta es Arecibo,*" the creature answered. The concept translator relayed the information as: "This is Arecibo."

Snorflapp chuckled with glee, and became alarmed when his delight was immediately translated into a bubbling wail. Fortunately, the bipeder continued to stand its ground. "It pleases me," Snorflapp hastily amended, "to be here on the planet, Arecibo. What are you known as?"

"I am called Angel Santiago, sir, and this planet is not called Arecibo. It is called Earth. Arecibo is the name of the installation that your ship has scorched and tangled. I work here."

"Ah, it is you who controls the signals?"

"It is I who controls the sanitation. But now that you and the Japanese alien have arrived. . . ." The creature expressively raised its upper appendages, "I guess I won't be working here any more."

"I'm sorry," Snorflapp said, tapping his translator. "I didn't get all that. You said something about a . . . Japanese alien?"

"Are you a friend of his?"

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"Whose?"

"The Japanese alien. Have you come to take him home?"

Snorflapp's juices increased their circulation. "Am I to understand," he said, "that there is another Contactor on this planet, this Earth? Another, like myself?"

"I don't know if he's like you or not," Santiago complained. "I don't even know what *you* look like; there's an alien in Japan, that's all. The scientists are there now, inspecting him. They left me here with instructions to strip, wax and buff the halls while they're away." He tossed his fuming object to the planet's surface and covered it forcefully with one of his peds.

"Incredible," Snorflapp whispered. "I realize that considerable time has elapsed since I replied to your message, but— You *did* get my reply to your message, didn't you?"

The bipeder blinked. "That was you?"

An awesome concept was moving toward Snorflapp. It was moving with the accelerating gravity of a dark singularity. What if—as Santiago seemed to intimate—what if this routine contact mission were to erupt into a major historical event? What if this were the long-awaited, oft-hoped-for encounter with beings of an equal or superior culture? What if this were the opportunity, at long last, to meet one's equal; to iris the entrance to new knowledge, new experiences, new positions? The very whisper of the thought with its attendant promise of status and personal reward sent Snorflapp's mind a-staggering.

He could become a glittering, system-wide celebrity. And, with fame would come wealth; enough wealth to buy a new vessel. GAWK! What was he thinking? He'd be able to purchase an entire planetoid, establish a mining concern, and live the rest of his life in luxury. He'd do talk shows, inscribe his experiences in the universal databank, have that delicate and expensive operation that was supposed to put zing back into your tentacles and blow the flugg from the folds of your neck. All. All would be Snorflapp's if he could contact, in outer space, life as he knew it.

And then the singularity collapsed upon itself.

What if this were only some renegade Contactor trying to hustle a piece of Snorflapp's territory? What if some clever slipper had managed to bleed Snorflapp's communicator, rechart the coordinates, and arrive on this planet ahead of schedule?

Snorflapp questioned the inhabitant closely. "Tell me all you know of this other alien. He arrived a short time ago?"

"Recently," Angel Santiago answered. "I've never seen him, remember, but I'm a close friend of the scientists. They confide with me, and I get my information from the horse's mouth, so to say."

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"Yes, yes," Snorflapp interrupted. "Was there any mention of fusion or fission? Has the alien tried to sell you anything? A plasma-form fusion unit?"

Angel Santiago paused to scratch his upper surface. "There's been a lot of talk of nuclear energy, if that's what you mean," he said. "I think someone spoke of plasma particles—"

Snorflapp cut him off. "Where can I find this alien? Direct me, please."

"I doubt that it will do you much good, sir," Santiago gestured, cryptically. "The Japanese are very upset. They envision a crushed and ravaged Tokyo and hate all monsters, in general, sir."

"Monsters?"

"It was all the scientists here could do to secure a promise that the alien wouldn't be exterminated until after they had arrived for an interview."

"Exterminated?" Snorflapp shrieked in panic. "Where? Where is this Japanese area? Tell me at once."

* * *

Igman-Luy tore at a cluster of kobuku trees, tilted his head upward to hiss at his captors, and thumped his tail in exasperation. He paced a tight circle in the shallow, confining valley, searching for some way past the ring of savages and their painful flaming weapons.

Escape was impossible. It was the thin atmosphere that was most fatal; Igman-Luy struggled to catch his breath. He fell to the ground. Exhausted.

First the explosive landing, then the panic-filled moments floundering in this planet's icy liquid, and finally the persecution. His name would be recorded in the lists of those lost in the mysterious triangular sector. He would die in the hands of these little, fear-crazed creatures, with their inquisitive, childlike minds and their flimsy, filthy habitats and their portable flame weapons. And, after he was dead, they would dissect his corpse, scooping and scraping, poking and tearing, inspecting every organ, testing every tissue, mastering their fear by disassembling the feared.

Was it any wonder that Igman-Luy had run screaming through the eastern section of Osaka? No, the wonder was that the despicable natives had failed to empathize or even recognize his perfectly understandable pain-flight, that they had pursued, attacked, herded him into this enclosure in the planet's surface, surrounded him with an ever-tightening cordon of the pale inhabitants, who were now edging forward, their dreaded armaments a-sizzle.

On a lost planet of an inconsequential star, light-years from any shipping lane, Igman-Luy looked Death squarely in the eye and refused to flinch. It is to his credit

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that, as much as the atmospheric conditions would allow, he held his muzzle high.

Which is why he was the first to see the speck.

The mob was busy preparing itself for one final consumptive blast when the speck of light appeared on the horizon. With a shrill, whirring urgency, it streaked closer, swerving to avoid a symmetrical, snow-capped volcano. Igman fancied he saw a ship of interstellar design, and his hearts leaped.

His persecutors dropped their weapons. As if caught in a terrible wind, some fled madly over the encircling ridge, while others hid among the foliage. Igman stood abandoned at the bottom of the valley, like the eye of an enormous target.

* * *

Even as his ship came over the horizon, Snorflapp had spied the pack of bipeders. They were swarming into an impression in the planet's crust, actively constructing a circle of fire around a large, ochre and green form. The canvasser reported that the form was an organism incongruous to this world. Further analysis indicated the odd org's basic life systems were in jeopardy.

Snorflapp landed and watched the inhabitants scatter. Ignoring personal safety, he twisted a tentacle through the exit gripper, punching out the proper code. He shouted a warning, telling the throng, which had begun to creep back, to stand clear of his static shield. The iris dilated, the protective enclosure coalesced, and Snorflapp was out.

The natives seemed not to understand. He watched with concern as they stumbled up the hillside. After a cursory inspection of their discarded instruments, it became clear that their intent had been to reduce the alien to a heap of smoldering residue.

Snorflapp grimaced and approached the huddled, dappled "monster." He had never encountered anything like it before. Ostensibly, it was reptilian, yet its optic structures were multifaceted. Its breath was labored. Its pulse was fluttering. The crackling brush fires gleamed off its pebbled surface. Near exhaustion, too weary to reflect any emotion save pain and fear, the creature shivered in Snorflapp's shadow, rippling its colorful hide, exuding infinite suffering and a touch of delirium.

Snorflapp telemetered his ship, ordered it to analyze the creature and enable him to establish a rapport with it. Moments later, he was announcing: "Salutations. My name is Snorflapp Candruthers of the planetary body existing beyond—how do you know it—Rosanosphro? I sympathize with your suffering. Do you comprehend my meaning?"

The scaled being shuddered. "Save yourself. Flee if you can."

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The crowd began to rumble and draw courage.

"Stay back," Snorflapp shouted to the crowd, employing the Arecibo matrix. The natives appeared startled and confused, as if they couldn't understand. Fleetingly, Snorflapp suspected there had been a dialect shift between here and Arecibo, but he was too busy with the expiring alien to worry about minor mash-ups. Directing his words at the polka-dotted dragon, he asked: "Who are you?"

Slowly, laboriously, came the reply: "I am Igman-Luy of an expanding cloud many years hence . . . I came riding an interstellar wind . . . a wave of high-intensity neutrinos tore my envelope. I fell, nearly shattered, spilling into this planet's liquid terrain. Death all but overtook me before I could struggle to a solid surface. Since that time, I have been pursued and persecuted unto death.

Conflicting emotions plucked at Snorflapp's conscience. He stood awed by the creature's recounting; its method of travel was baffling, its poetics appealing. There was an excitement in the experience, an unease that anguished yet rang true to the core of his being. "Where," he mumbled, "did your craft go down? Can it be salvaged? Repaired?"

"My envelope," Igman-Luy answered, "was absorbed into the vast planetary liquid. It is, I fear, no more."

The time had come for him to ask the key question, to apply the test his people had devised long ago. "Can you," Snorflapp asked with serious resolution, "identify this sound?"

"What? Another test?" panted the alien. "Another analysis for intelligence? Can't you see I am dying? Go away. Escape!"

Snorflapp suffered a flush of embarrassment, as well as a slight touch of fear that his opportunity was slipping away. "Please, my scaly friend— May I call you friend? Please try to understand; I'm greatly interested and hopeful of assisting you."

Igman-Luy responded wearily, "Oh, I understand. . . . Were I in your place, and had I my envelope and liaison devices, I would probably be doing the same thing. I've often dreamed of discovering true intelligence in outer space, but— Keep them back! KEEP THEM AWAY FROM ME!"

The bipeders were regathering their armaments. Snorflapp noted the movement and Igman-Luy's violent response. "It . . . might be possible," he said, "for me to afford you the protection of a static shield similar to the one I'm wearing, if you're at all interested. It would defend you from further physical attack."

"Could you help me escape this mud ball planet, too?"

Snorflapp calculated. "The two shields *would* effectively separate us and prevent contamination. . . ."

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The saurian became suddenly excited. Its wide tail thumped the ground. "Salvation?" it cried. "Hope?"

Snorflapp cleared his throat. "Mutual trust would, I think, benefit us both," he said, judiciously.

"Yes, yes. I'm sure you're right," Igman-Luy responded nervously, eyeing the approaching mob. "Ask me your question. Give me your test. And, should I fail . . . afford me a quick and painless death, please."

Snorflapp was equally nervous, but he signaled his ship, ordering it to fill the air with a crackling, boiling set of auditory cues. "Can you," he repeated, "identify this sound?"

The alien cocked its head momentarily and said, "It has something to do with cooking; am I right?"

"You're getting warm."

The orange-and-green reptile cast another worried glance at the massing natives. "Perhaps," it said, "it would be better if you clothed me in that protective shield of yours, before the attack is renewed."

"It'll only take a second. Finish your answer first. I'm timing the response."

"Oh. Ah, it's weird," said the other, "but, I seem to be receiving some sort of low-level impression concerning your offspring; or is it mine?"

"Go on."

"It—it's an image of direct descendants. Children. Children cooking? No. Children being cooked! My Crat, that's barbaric! You cook and eat your offspring? It's disgusting, revolting. You're a race of heathens, unclean, worse than the pale little monsters that surround us. How can that be?"

Upon hearing these words, Snorflapp's fear melted like a comet at perihelion. The old test had proven true. He tried unsuccessfully to mask his enthusiasm.

"That's it," he laughed. "You've passed. You've passed on all three levels."

Igman-Luy was bewildered.

Snorflapp nearly glowed with delight. "Please, believe and excuse me," he gushed. "The test was designed to diagnose altruism, as well as intellect and intuition. Your disgust and revulsion were necessary qualities; they identify you as a member of a responsive and compassionate race. I can't tell you what this means to me; until this moment, the sound has never been correctly identified. These natives, for example, probably would never have guessed it, and my trip would have been far less important than it is now that I have met you. Here, let me signal for the protective static shield."

Igman-Luy was dazed, but he felt less anxious after the auxiliary shield had coalesced around his body. He sensed a touch of the bizarre in this oozing creature's thoughts, but he knew a firm faith

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and undaunted trust would do much to further the relationship and absolve suspicion.

While the two aliens lumbered together up the hill toward the interstellar craft, the crowd grew furious and renewed its attack on the now-invulnerable pair.

"We'll share the fame and profit," Snorflapp gestured expansively, and an unnoticed inhabitant sailed majestically through the air. "When I think of what might have happened had I not arrived in time. . . ."

Igman-Luy turned and looked out over the throng before entering the ship. "You're right, my friend," he sighed. "It is indeed strange; the timing is uncannily perfect. In a way, this planet has been a buffer absorbing the trauma of our first meeting." The proud dragon turned and moved into a cushioned seat, preparing himself for escape. "But, the important thing is that you and I have met without suffering the usual suspicion and fear. I see a great future for our two races, Snorflapp. I see a glorious union that may, someday, take us beyond the confines of our own galaxy."

Snorflapp was elevating his ship through the planet's swirling fog and clouds. "You know, Luy," he said, "I think this is the beginning of a beautiful friendship."

★ ★ ★

A configuration of iron filings was magnetically arranged on the surface of the visualizer plate, creating an image of the revered leader of the Te'nop Complex.

Congratulations, said the leader's image. *By successfully spanning the interstellar gap, by averting a hostile interphase between the twin cultures, by insuring the safety of future intergalactic contact, your punishment is at an end. Return to our galaxy for a hero's welcome.*

"Thank you, sir," said Angel Santiago. "You've no idea how long I've waited to hear you say those words." ★

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THE BEST TO JIM

FAITHFUL READERS of GALAXY will notice something missing from the masthead next month—the name of James Patrick Baen. Jim will be sorely missed here, and we know you'll miss him too. Any editor whose magazine increases its circulation more than 50 per cent in less than a year must be doing something right!

But we can understand the siren call that has drawn Jim away from GALAXY to become science fiction editor of Jim's caliber, we think ing publisher of sf, Ace has gone through some lean times in recent years—but with the support of its new owner, Grosset & Dunlap Inc., Ace is making its big move to become Number One again. With an iditor of Jim's caliber, we think they'll do it.

First as managing editor under Ejiler Jakobsson, then as editor in his own right, Jim spent four years with GALAXY. It was a brief tenure compared to those of the celebrated H.L. Gold and Frederik Pohl, but it will be remembered just the same. Jim's devotion to the magazine was equaled only by the devotion of thousands of readers.

"I found it a very rewarding job, though at times a frustrating one," he says. "The single greatest award was the interaction with the general readership, for which I have an even greater respect now than I did four years ago."

That respect was the real secret of his success. He respected the *intelligence* of his readers; he looked up to them and they looked up to him. This relationship is one that is difficult for any editor to achieve—but achieve it he must to be a success for very long in any field, especially science fiction.

At Ace, Jim will have every chance for even greater success. For starters, Grosset & Dunlap is making a big financial investment on a

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major sf program. Tom Doherty, senior vice president for Ace, received a standing ovation from members of the Science Fiction Writers of America at a recent meeting. And if you know anything about the SFWA, you know how rarely that kind of thing happens.

Plans call for at least 110 titles a year—two thirds of them new acquisitions, the rest from the backlist. But that's only the beginning of Jim's plans for this latest chapter of his science-fiction career.

For instance, he plans to start his own magazine (yes, a competition perhaps but we're generous-minded enough to welcome that). It will be a paperback book-size bimonthly but that will be its only resemblance to original anthologies such as *Orbit* and *New Dimensions*. It will have its own editorials, science column, book reviews, interior illos, maybe even letters. Nothing quite like it has been done before, save as a one-shot experiment.

For another instance: Running backlist material will not necessarily mean just reprinting from old plates and, at most, slapping on a new cover. For a Poul Anderson Month promotion in February, one of the six Anderson titles is a book previously issued as *War of the Wing Men*—a condensed version of a novel serialized as *The Man Who Counts*. Jim is restoring Anderson's original title and allowing him to restore the text to his own satisfaction.

A two-volume omnibus of Anderson's work, *The Flandry Companion*, will put together several stories in the *Flandry* series that have seen print before (more or less at random), plus a new 40,000-word short novel devoted to the adventures of Anderson's galactic secret agent. Plus a chronology of the future history through which Flandry moves. Plus an introduction by Anderson himself. Plus an afterword by noted sf critic Sandra Miesel.

Fritz Leiber's *Conjure Wife*, a classic horror story of witchcraft in a modern college campus setting, has never received much promotion in several paperback editions. But Ace will treat it this time as a Major Publishing Event, with a big advertising push and special dumps (black lettering on copper foil, or copper or black, to match the two alternate covers) for book stores.

Putting in that much work on the backlist is almost unprecedented in science fiction—but Jim plans to do it as a matter of course, and not only for Anderson and Leiber.

As for those new titles, Jim is playing his cards pretty close to his chest but he hints, "One or two of them may be startling." One thing for sure, he adds: "Ace is going into very aggressive development of its sf list."

That list may include a revival of the famed Ace Specials, which earned much prestige for the firm under Donald A. Wollheim and Terry Carr in the old days. It may

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also include a new sf series, more sophisticated than the familiar adventure series of the past, with its own distinctive format and artwork.

Ace Doubles, the vehicle for many short novels in the past, will be continued—but with a new format: single covers, with both short novels printed right side up. In general, it will be the policy to feature the same author in both halves of each double.

GALAXY readers will be glad to know that Jim's connection with the magazine will not be *completely* broken. Tentative plans have been laid for a series of GALAXY Specials (centered around such themes as future warfare and alien contact) that will be published simultaneously in magazine format by us and in paperback format by Ace.

Jim also has tentative plans for Ace to publish another *The Best of GALAXY* anthology, using material from his last year with the magazine. He may even issue a *Best of the Best of GALAXY*, culled from the last four years.

Here at GALAXY itself, Jim's last direct contribution is this month's editorial outlining an outlandish (but practical—check out Jerry Pournelle's response) proposal for broadcast-powered electric spaceships.

But his influence will be felt even after his official departure. Starting next month, for example, is the three-part serialization of Roger Zelazny's *The Courts of Chaos*, final novel in the famed *Amber* series (with a cover by the noted Wendy Pini, yet). It was one of Jim's last and proudest acquisitions, and it will be a treat for all who have followed the chronicles of Amber here the last few years.

Also coming up in GALAXY next month is Charles Sheffield's "The Long Chance," a love story with a difference. And watch for such delightful items as Thomas Wylde's "Jogging up Main Street" and Herbert Gerjuoy's "The Holy Temple"—new stories by new writers Jim discovered during his last few months here. Some of his acquisitions will still be appearing in December and beyond.

In science fiction the writers, editors and even many of the readers form a close-knit community. Professional relationships are rarely distant or anonymous; people *know* the people they're dealing with. Being a success means being one of the Good Guys, and Jim Baen has always been one of those—ask anyone who has dealt with him.

We at GALAXY are sorry to see him leave, much as we wish him all success in his new position. During his years here, he has earned our respect, just as he has earned that of sf professionals and readers. In science fiction circles, he is considered one of the top young editors. We know he has the ability to go far and we're going to enjoy seeing him do it.

AEA, Publisher

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STAR WARS—Pro and Con

PRO—Jay Kay Klein

"THE GREATEST science-fiction picture ever made," was the first comment I heard about *Star Wars*—over the phone by a well-known science-fiction editor and publisher who had just been to the world premiere. A few weeks later the picture reached the upstate New York city where I live, and the next day it was reviewed favorably on the *front page* of a local paper—setting an unheard-of precedent. *Star Wars* is obviously something special.

So far I've come across only two dissents, strangely enough by the editors of two leading science-fiction magazines. One appeared in the letter column of *Time* magazine and the other was expressed to me as I sat next to Jim Baen during the banquet of a science-fiction convention in Syracuse, New York, where Jim was the guest of honor.

That afternoon the conventioneers had gone *en masse* to see *Star Wars* and I had been surprised to find myself in a minority of persons who had not already sat through at least one showing. Most of the fans had attended two or more times, with one young man claiming a total of six.

Afterward everyone discussed exactly which Academy Awards the picture would take. Certainly Special Effects, probably Best Picture, and absolutely not Best Actor.

The picture obviously was put together by someone who understands and appreciates science fiction. *Star Wars* is *pure* science fiction, with the background of understanding we have come to take for granted in stories appearing in *Galaxy*: interstellar empire, alien intelligences, self-directed robots, FTL drive, super-powerful weapons and strange-and-wonderful sights of all kinds. If there *is* an erring, it is on the side of assuming that viewers are fully acquainted with such stand-

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ard science-fiction elements. To Hollywood's surprise (I would suppose), theater-goers have been taking it all in stride and asking for more.

They're certainly going to get more too. Everything I've heard indicates that there will be 57 or 157 or maybe 257 varieties of science-fiction pictures churned out in the next several years. Presumably the first ones will be the worst ones.

Star Wars' influence lies, first, in opening the floodgates for mass production of future science-fiction pictures and, second, in setting standards by which movie-makers can judge what the mass public wants to see. We must make no mistake in thinking that fans alone are piling up the millions in theater ticket-offices. We should be thankful, though, that this feat was accomplished by a real, hard-core science-fiction film. At the heart of the performance is an honest, thoughtful attempt by Lucas to present a genuine view of the future, an attempt that comes across with sincerity and with the best presentation that technology can create and money can buy.

What *2001* did for ten million dollars ten years ago, *Star Wars* has surpassed for ten million dollars in inflated 1977 currency. This was made possible by the same electronic developments that are revolutionizing the rest of man's world. The computer made *Star Wars* possible, and at relatively low cost. Machine-generated visual projections—camera views of what *must* be models (even if your eyes tell you everything you see is full-size and real), a planet exploding, star ships annihilated, warriors zapping enemies and everything else that comes under the Hollywood term of "special effects"—all these must be traced to the availability of powerful computers and associated graphic interface systems.

Gone forever in any future science-fiction picture are papier-maché tunnels, balsa-wood spaceships strung from wires, extras dressed in rented Halloween costumes. *2001* may have been a critical success (after all, it was very obscure) and it even made money but it started no ensuing school of science-fiction pictures.

I have been told that Kubrick's *2001* scene-cutting techniques have influenced subsequent films of all types. Lucas's *Star Wars'* special effects will influence all subsequent science-fiction films. Since in a very real sense, science-fiction films are "people" stories laid in unearthly surroundings, Lucas' trend-setting contribution is bringing the science-fiction film to maturity. Just as we can divide science-fiction stories into those pre-dating Stanley Weinbaum's unprecedented "Martian Odyssey" and those that came after, I believe we will be able to divide science-fiction films into those pre-dating George Lucas' *Star Wars* and those after.

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Discussion among fans differs wildly from the criticism prepared by reviewers for the general press. The attitude of the latter is that *Star Wars* is a cowboy picture set in the future. I would guess that such statements are the results of cultural shock. When an unsophisticated person sees something beyond his limited personal experience, he can describe it only in terms familiar to him, no matter how irrelevant or off-the-mark these may be.

Dismissing *Star Wars* as a cowboy picture in fancy costume is as bad a reading as referring to *Romeo and Juliet* as a boy-meets-girl story. *Star Wars* is not simply good guys versus bad buys but a depiction of free men banding together to resist a gigantic tyranny, along with coming-of-age story mingled witha a mystical from-the-Far-East philosophy. All of these themes are appealing to today's young people, who not coincidentally, I am sure, form the largest group of moviegoers and science-fiction readers. Lucas must surely have aimed at those most likely to turn his production into a box-office smash. Young people's enthusiasm for a story provides no reason to suppose it is in any way a poor piece of literature; otherwise *Treasure Island* would have been forgotten years ago.

Where *Star Wars* does show weakness is in the stock, cardboard characterizations of the humans, a fault shared by most science fiction of the past and by much of the present. That is why the two robots—by universal consensus—"steal the show;" they are the only fully realized beings in the picture, along perhaps with the Wookie. Again, this situation is common in science fiction. Doc Smith's *Lensman* series, still popular with young people after more than thirty years, features cardboard humans and interesting aliens. In theme, content and treatment, *Star Wars* and the *Lensman* stories are close cousins, if not identical twins. Oh—and it occurs to me that *now* Doc Smith's *Galactic Patrol* can be put on the screen, using Lucas's cinematic processes.

The strength of science-fiction stories lies more in what happens, how it happens and where it happens than in to whom it happens and what was said while it was happening. The problems for fans loom ahead, first with movie-makers fired with zest for Art, what college literature courses refer to as the "human condition." Tie this approach to an Oedipus myth or something else left over from ancient Greece, along with portentous dialogue, and we may look forward to real disaster pictures.

The second danger I foresee is a repeat of many, many past situations wherein producers who don't understand science fiction at all assign work to directors who despise it. The difference in the future is that even bad science-fiction films will have beautiful settings and spe-

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cial effects. Fans will come out of theaters wondering how anyone could do so little with so much.

Leaving a *Star Wars*' showing, fans launch directly into discussion of the superb details Lucas has thrown in with such a lavish hand. The visual throwaways alone, glimpsed for just a few seconds, provide a richness and complexity never before seen in a science-fiction film. In *2001* an occasional bit of business such as a familiar IBM logo placed in an unfamiliar, futuristic setting was treated with lengthy heavy-handedness. In *Star Wars* there are literally hundreds of brief flashes of the future and it is these that lead fans to see the picture several times. *Star Wars* is not a quickie film in any sense of the word.

The reviewers that likened *Star Wars* to a cowboy picture apparently failed to see C-3PO's and R2-D2's function as comedy relief against the serious backdrop of the threat to billions of people of annihilation. Nor did the reviewers—lacking any knowledge of science fiction—note the similarity of setting on Luke Skywalker's planet to that of *Dune,* even to the Fremen-type stillsuit worn by the Tusken raiders. The inclusion of Obi-Wan Kenobi's universal Force and philosophy of living raises the picture above a level of simple materialism and provides Luke with a father image for growing up, while giving the production a *deus ex machina* to help move the plot along. (And I predict that Alec Guness's part will help the picture do fabulously well in Japan!)

There are, however, some genuine objections that can be raised to *Star Wars*—having to do with credibility. Jim Baen, for instance, was concerned with several possible errors. One was why an Imperial starcruiser would take aboard a captured starship when there was every possibility that the captive might self-destruct violently. Another was how tiny fighter ships could zoom along Death Star's surface when the much larger and more powerful blockade runner belonging to Han Solo was trapped in the battle station's magnetic beams.

The answer to these points lies with internal consistency. Since we are dealing with the future and a wide range of experience outside present-day knowledge, almost anything may be possible as far as we know. But the impossible in one part of the film cannot miraculously become possible in another. In a contemporary film when, say, a person driving a Ford is pursued by a police car, we do not wonder why the driver didn't speed up to 300 m.p.h. or go straight up the side of a cliff to shake off the follower. We know what's possible and what's impossible, and the film-maker operates on the assumption that we do indeed know these things about the world. . .and that this knowledge justifies our expectations.

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Being set in the far future, *Star Wars* may have its own implied consistencies. If the Imperial star-cruiser took aboard a captive ship, there is every reason to suppose it was placed in a heavily shielded area. Certainly Luke Skywalker, Han Solo and the Princess were able to blast their way through ordinary interior walls but they were helplessly trapped in a waste-treatment chamber where dangerous objects such as laser weapons might find their way for reduction to scrap. Nor is there any reason to suppose one-man fighters would be made of magnetic materials. To the contrary, being light and highly mobile, the rebel ships might very well be constructed entirely of aluminum or plastics—or austenitic stainless steel, for that matter.

The few parts that disturbed me were lapses such as Han Solo's comment that his ship was so fast it could reach Alderan in 15 parsecs. Well . . . very few period pictures avoid all outright errors, anachronisms or a fumble over something that only an expert would discern. The remarkable thing is that *Star Wars* has so few mistakes of this kind. More serious were what I consider weaknesses of motivation or commonsense. Luke may have been young but his readiness to endanger his mission and his life to rescue a princess he had never before heard of was simply childish. I will say that she was well worth rescuing since she turned out not to be a fairy-tale cliché. Armed with a laser weapon and in comparison with her rescuers, she reminded me of David Ben Gurion's description of Golda Meier: "She's the only man in my cabinet." (Makes you want to give Princess Leia Organa the well-known mattress test.)

To me the worst of all unbelievabilities was Luke's instantaneous conversion into a fighter pilot. Surely high-order training of at least some months' duration would be required for this. To give Lucas credit, this and nearly every other plot weakness was given some sort of explanation. It had been established that Luke was an accomplished pilot in a planetary game similar to mechanized polo.

I've heard it stated that the fact of Luke's piloting, along with other plot groundings, had been more fully developed in some twenty minutes of film cut from the finished picture. Hopefully, this cutting was done to improve the pace and not to permit theater owners to squeeze in three matinees in place of two. *Star Wars* moves at a fast pace, sure enough. Unlike *2001*, in which the cameras dwelled lovingly on a scene to the point of boredom, *Star Wars* piles visual impression on top of visual impression. One of these is that of Darth Vader spinning out of control and away from the exploding Death Star; then—in just a few seconds shown on the screen—he regains enough control to present us with the possibility of

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his return in *Star Wars II*, along with an Imperial fleet as yet untouched by attrition.

I'd also vote *Star Wars* the best science-fiction picture made so far. It heralds the first in a new era of science-fiction films, some of which will surely be as good—and a few even better. Meanwhile, I'm going to see *Star Wars* at least one more time. I'd not be surprised if you did too. ★

CON—Jeff Rovin

I RECENTLY RECEIVED a phone call from a young science-fiction buff who was busy recruiting members for the Jedi Knights, a *Star Wars* fan club.

"We're not like Trekkies," he assured me. "Our group is devoted to a serious study of *Star Wars*, the Force and alien beings."

I thanked the caller but begged off from membership. When asked why, I explained that while *Star Wars* had an excellent musical score, the rest of the film was pure dross. Stunned, the knight errant muttered an oath and hung up.

Not like *Star Wars*? Impossible. Everyone *loves* the film—including the critics. *Star Wars* is breaking box-office records everywhere; it played a command performance at the White House; and there's even talk of its snaring a record number of Oscars. Several sequels are in the works; the novelization by director George Lucas is a bestseller; the Twentieth Century Fox merchandising department is up to its nearsighted eyeballs in orders for everything from posters to forty-dollar Stormtrooper masks to home-movie films. All of which goes to show that, unfortunately, public taste *is* what it used to be.

Back in the 1930s and 40s people flocked to Saturday-afternoon matinees at local movie houses to watch the latest episode of a Flash Gordon or Buck Rogers serial. In their day these chapter plays were superb entertainment. With contagious hubris, blond, young Buster Crabbe played both heroes as naive men of fortitude, while dogging their footsteps were exciting battles with exotic weapons, bizarre alien races and the nastiest villains the screen had ever seen. Loads of fun, these

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serial space operas were as plausible as any as far as the technology of the era was concerned. Then came Hitler's rockets, the space race and the lunar and Martian landings, and we became progressively more sophisticated in our view of outer space. The better science-fiction films of these succeeding decades reflected this growing maturity by melding more or less credible plots with realistic hardware, i.e., such pictures as *Destination Moon* (1950), *Forbidden Planet* (1956), *2001: A Space Odyssey* (1968) and television's *Star Trek*. Flash Gordon and Buck Rogers? Progress had reduced them to quaint relics of a more whimsical time.

Enter *Star Wars*, which dips into this by-gone froth for substance. As a result, it spins the simple-minded story of blond, young and naive Luke Skywalker from the desert world, Tatooine. Buying robot R2-D2 and its sidekick, C-P30, from merchants, Luke soon learns that these are no ordinary mechanizations. They belong to Princess Leia Organa, who has been kidnapped by Grand Moff Tarkin of the dictatorial Galactic Empire. However, before her abduction Leia hid blueprints to the Empire's lethal space station, Death Star, inside R2-D2. These plans must reach rebel authorities if the Empire's planet-destroying globe is to be stopped. Thus Luke adopts the lovely Leia's cause and—with the robots, the telekinetic Jedi Knight Obi-Wan Kenobi, a mercenary named Han Solo and Solo's hirsuite associate Chewbacca (a seven-foot-tall Wookie pirate)—encounters nasty antagonists, does battle with exotic weapons, meets bizarre alien races and wades through other situations plucked straight from the Buster Crabbe films. Eventually he rescues the princess, delivers the blueprints to rebel forces and helps them locate a weak spot in the structure of the Death Star. Leading a fleet of small ships against the giant sphere, Luke is able to blast it to smithereens.

If you're the general public, you have been calling this motion picture "escapist fun." However, if you're a thinking individual, you find yourself wondering how anyone could produce such twaddle. Not only is it a collection of science-fiction gimmicks that went stale over a quarter-century ago but it wallows in a sea of platitudes from western, pirate and war films. To wit, we have a gunfight in an alien saloon; a dogfight with one-man spaceships; a swordfight in a bay of the Death Star (what Errol Flynn and Basil Rathbone would have done with this sequence; now *that's* escapist fun!); and so forth. Perhaps this is Lucas's way of saluting the great adventure films of the past. But a cliché is a cliché, and the director has succeeded not in enriching his film through imitation but inducing us to yearn for the exuberant originals all the more!

Yet *Star Wars*' negligence lies

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not only in its lack of structural invention. There is also an annoying *Wizard of Oz* garnish that makes it oh-so-coy, what with a tin man (C-P30), an often-times cowardly lion (Chewbacca), Dorothy's Auntie Em (Luke's Aunt Beru) and munchkins in the form of the robot-scavenging Jawas. Even the golden sands of Tatooine are a Yellow Brick Road of sorts, which Luke crosses to find the wizard Kenobi. If a science-fiction author handed a story like that to a responsible science-fiction publisher, it would quite properly be shredded and diced before his or her very eyes.

Too, though in itself a minor annoyance, the picture opens with several paragraphs that explain the political situation as it exists before the narrative proper begins. This crawling prologue creates the impression that one has stumbled upon the second installment of a two-part story! Actually the passages are more telling than they seem. Such copy has traditionally prefaced historical epics like *El Cid* and *The Guns of Navarone,* where there was a wealth of factual data to present to the audience. However, in *Star Wars,* a work of fiction, there was no reason to burden the viewer with such tritely organized exposition. It was simply a means for the scenarists to set the stage through other than cleverly constructed dialogue.

As it turns out, *Star Wars'* greatest problem can be traced to screenwriters who didn't do their job. The film's lack of engaging plot aside, it is devoid of any dramatic style or wit. Spoken exchanges are puerile and do nothing to flesh-out the characters. When Luke's aunt and uncle are slaughtered by Empire Stormtroopers on suspicion of harboring R2-D2, we don't care; in the interest of getting on with the shoot-em-up action, Lucas avoided the kinds of scenes that would have given these characters depth and made Luke's decision to avenge their death a rousing crowd-pleaser. Later in the film Han Solo deposits Luke and his party at the rebel camp, collects his fee and leaves—only to come rocketing back into the film just as Grand Moff Tarkin's right-hand tartar, Darth Vader, is about to ice Mr. Skywalker. Why the abrupt change in the mercenary's temperament? Until this moment there is never a hint that Solo might be loyal to more than just himself and money.

Further blanching this mildewed corn are performances that fully complement the script: dull and deadpan. This cheats the movie of what may have been its lone saving grace, a tongue-in-cheek approach to give it some sparkle (the way it did Richard Lester's magnificent 1973 movie, *The Three Musketeers*). It all adds up to characterizations that are wholly two-dimensional, an amateurishness that is intolerable in any form of drama.

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On a different level entirely, the picture's technical work has naturally been likened to that of the last great space film, *2001: A Space Odyssey*. It is a comparison that puts *Star Wars* way out of its league. Visually there is none of the breathtaking movement, design or poetry that made Stanley Kubrick's picture so memorable and, special effectswise, the alien makeup is plastic and unconvincing (contributing artist Rick Baker, the man who built and played Dino De Laurentiis' *King Kong*, has done better), while the mattes (the union of miniature models with life-sized sets) are imprecise.

Scientifically *Star Wars* is also inexcusably careless, boasting an offensive disregard for both physics and biology. For example, living in the Tatooine desert are shaggy giants known as *banthas* (another tribute to the moldy past, this time to Edgar Rice Burroughs' Martian *banths*). Earth's Ice Age mammoths didn't have so much hair! Then there are alien beings that look like humanoid walruses, insects and other terrestrial creatures. Why wasn't any thought applied to creating invertebrates, quadrupeds or beasts whose design immediately describes foreign worlds and climates? And what about the auditorium-sized garbage compactor on the Death Star? Surely peoples who have mastered matter-reorganization on a nuclear level would have a cleaner means of destroying or recycling waste and the efficiency for more productive use of that area of the space vessel. Compounding these inequities are tractor beams that work on some spaceships and not on others, as the plot decrees; areas in Empire ships for the exploding of captured crafts—blasts for which the alleged shielding would have been insufficient protection; and so on. Clearly, anything that pleased the film's creators was tossed into the action, regardless of how little scientific sense it made.

However, independent of these various failings, *Star Wars* does succeed in one respect: It totally revolts those viewers, myself included, who feel that surrogate Nazis have no place in light entertainment. Images ranging from the name Stormtroopers to the turned-down brim of Darth Vader's headpiece (reminiscent of German helmets during World War II), to the brusque and joyless manner of the Death Star personnel, to Grand Moff Tarkin's Goebbels-esque demeanor—all these are far too serious to be used in a frivolous fantasy. It's simply another example of lazy film-making, a means of distinguishing the good guys from the bad guys when one wishes to skip character development in favor of filling the screen with proton torpedoes and lightsabers. At best, these icons exhibit a spurious sense of responsibility on Lucas's part.

So much for *Star Wars* and its

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faults, large and small. Judging from the picture's staggering success, audiences are willing to put up with these flaws, a fact that bodes ill for the field of science-fiction films. The coming years will now see a giddy flood of *Star Wars* imitations, including a remake of *Buck Rogers* and a TV series entitled *Star Cop*, that will taint the saleability of provocative works for some time to come. Would that more intelligent and stimulating space fiction like Arthur C. Clarke's *Earthlight* or Ben Bova's *Millennium* had been brought to the screen instead of *Star Wars*!

Of course only a pompous bonehead would insist that all science fiction illuminate some foible of life, pontificate about morality or confront the worth of society's values. We all know that authors like Frederic Brown and Harry Harrison have spun wondrous, classy nonsense for its own sake. However, these works have a fundamental pith and originality that is totally lacking in *Star Wars*. Not that 99.9% of the people who see the picture realize this, since they have never read science fiction and are not old enough to remember Buster Crabbe. In this respect it is conceivable that the movie may open young eyes, fire a few minds and turn people toward quality material. The field can always use enthusiastic converts! But this does not let Lucas off the hook: Science fiction is too damn broad and exciting a genre to justify the creation of a mindless pastiche like *Star Wars*, no matter what its tangential benefits.

But don't take just my word for it. Former *Galaxy* editor H.L. Gold said it best when he ran the following rather prophetic comments on the back cover of this magazine's first edition in October of 1950:

> *Jets blasting, Bat Durston came screeching down through the atmosphere of Bbllzznaj. He cut out his super-hyper-drive for the landing . . .and at that point, a tall, lean spaceman stepped out of the tail assembly, proton gun-blaster in a space-tanned hand.*
>
> *Hoofs drumming, Bat Durston came galloping down through the narrow pass at Eagle Gulch. He spurred hard for a low overhang of rimrock. . .and at that point, a tall, lean wrangler stepped out from behind a high boulder, six-shooter in a sun-tanned hand.*

"Sound alike? They should—one is merely a western transplanted to some alien and impossible planet. If this is your idea of science fiction, you're welcome to it! YOU'LL NEVER FIND IT IN GALAXY!"

Alas, we have found it on the silver screen, and the genre shall long be poorer for it. ★

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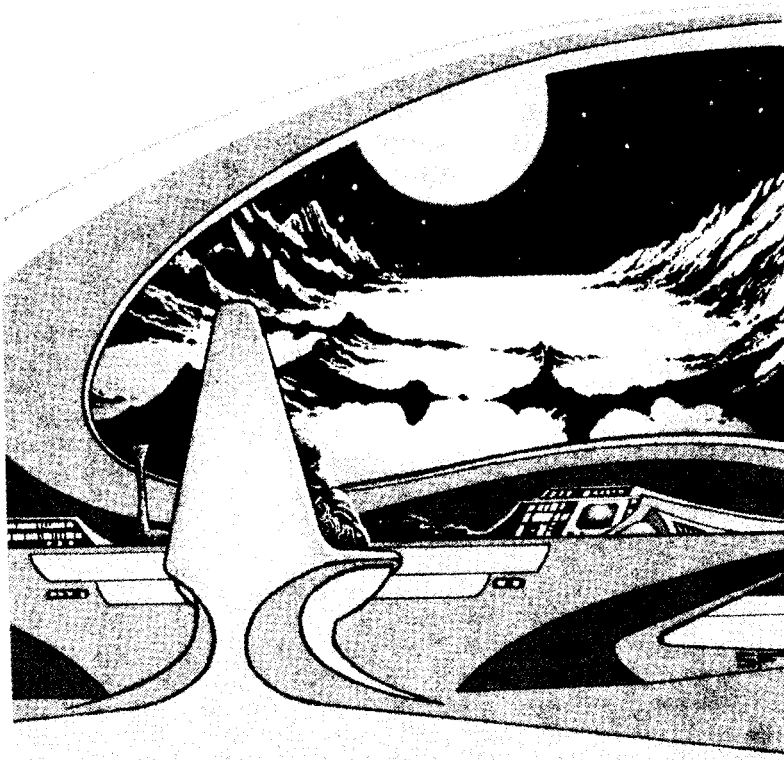
EXILES TO GLORY



J. E. Pournelle

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WHAT HAS GONE BEFORE

The ecology and zero-growth movements have partially succeeded. A few international corporations have gone to space, but the enormous capital investments have left them in a financially shaky position, while scandals in government have rocked public confidence.

KEVIN SENECAL has grown up in this world. He comes from a welfare family, and has entered UCLA on a govenment scholarship; the universities are largely structured to keep younger people off the labor market. Tempermentally a loner, Kevin has made few friends, and his main ambition is to obtain his engineering degree so that he can join a powerful union, get a job, and enter the middle class. A few weeks before graduation his comfortable world comes apart.

First he is attacked by muggers and in defending himself kills one of the juveniles. The public authorities will prosecute him for "child killing" if they learn Kevin's identity—and the Green Fence gang, to which the muggers belonged, already knows who Kevin is. They seek revenge, and his life is in danger.

Meanwhile the administrators at UCLA find irregularities in his academic work, and although he can demonstrate his competence, will require two more years in school before he can graduate. Battered by these pressures and disgusted by the society he lives in, Kevin, on the advice of one of his professors, applies to the Deadalus Corporation. He is offered professional status—labor is not so easy to come by in the asteroid belt because few have ever returned—but he must leave Earth immediately. Kevin rejects the offer, but a new attempt on his life by the Green Fence gang convinces him he has no choice.

Kevin flies to Baja California where the Hansen Corporation maintains a laser system for launching personnel and cargo into orbit. At the Hansen facilities he meets Bill Dykes, a former Lunar rockrat; Wiley Ralston, a classmate at UCLA who has recently graduated; and Ellen MacMillan, an engineer who has bought her own ticket to Ceres.

The launching system malfunctions and Kevin and Ellen are nearly killed. Kevin does not believe it was an accident, but he knows no reason why anyone would be interested in killing either him or MacMillan. Ellen, however, does not seem surprised. She insists that they go on board Wayfarer *on schedule rather than wait for an investigation of the accident; the ship will not delay departure, and* Wayfarer *may be the last passenger/cargo ship to Ceres.*

Kevin's cabinmate aboard Wayfarer *is Jacob Norsedal, an overweight, diabetic computer freak. The voyage to Ceres lasts nine months, and during that time Kevin and Ellen have a brief romance, complicated by an almost total lack of privacy (there are 120 people in a ship designed to carry only 60) and Ellen's insistence that she will not form any lasting relationship. Their affair is to end when the ship*

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CERES

Asteroid at average distance 257 million miles (2.767 AU) from Sun.
Mass: 8×10^{23} grams. Radius: 370 kilometers.
Surface area: somewhat larger than the state of Texas.
Period: 4.6 years. Rotation: 9 hours, 5 minutes.
Surface gravity: 38.9 centimeters/second = .04 Earth gravity.
Escape Velocity: 5.37×10^4 centimeters.
Path velocity in orbit: 17.9 kilometers/second.

Largely composed of stone, Ceres has an easily accessible metalic core containing rich, commercially valuable deposits of gold, silver, tin, copper, nickel, and iron, as well as super-heavy elements such as Arthurium in recoverable quantities. Water-ice exists both in permafrost and underground deposits.

The first expedition to Ceres in 1997 was financed by Hansen Enterprises (Ltd. et Cie, General Headquarters Luna). Interplanet of Zurich subsequently made extensive investments in mining and refinery operations on Ceres. The commercial future of this venture is uncertain.

reaches Ceres.

At a critical point in the journey Captain Greiner and Chief Engineer Felipe Carnel discover that both the high-gain antenna and the ship's computer have been sabotaged. Both are repairable, but the repairs will take long enough to keep the ship from rendezvousing with Ceres; it must return to Earth. Without the supplies and personnel aboard Wayfarer *the Ceres mining project will have to be abandoned.*

Jacob Norsedal uses his personal computer to calculate the thrust needed for landing on Ceres. There is another attempt at sabotage and Kevin and Ellen are involved in a desperate fight with Martin Pacifico, a legal expert who wants to stop the ship from making the attempt to land on Ceres. Pacifico is killed; and it is found that George Lange, Kevin's supervisor within the Deadalus Corporation, is missing.

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XII

THE OFFICE WAS Aeneas MacKenzie's only real luxury. It had a real window of thick quartz that overlooked the barren landscape of the Moon, and beyond that the glory of Earth hung suspended in black velvet. He often sat at his desk and stared out at the fragile Earth, a small blue world wrapped in white wispy clouds. He had lived on the Moon for twenty years and would never return to the world of his birth; but he loved Earth, and he missed her.

So little time, he thought. So little time until—he broke off the thought, because he had a vivid imagination, and it would be all too easy to see the fragile Earth covered with pinpoints of brilliant light, lights that would shine more brightly than the Sun until they faded and the ugly mushroom clouds rose through Earth's clean garments.

It would be easy, too, to imagine that he could see beneath the clouds, watch men and women working their lives out to no purpose but continued misery and starvation. That was life now for all too many; in a few years the globe might be covered with people who had nothing left to hope for. Desperation might tempt them to anything.

There were faint sounds in the office: the whine of the air system, the faint rumblings of his miners digging into the lunar regolith, other sounds of construction and expansion; the sounds of success, and they mocked him. The future of Diana Base, and of Earth, did not depend on lunar miners. It depended on hard-eyed men in dark suits who sat in Zurich board rooms; it depended on the man in the Oval Office in Washington, and another man in the Kremlin; but mostly it depended on events more than a hundred million miles away, and over those Aeneas had no control.

His reverie was interrupted by a voice in his head. It made no sound, and if there had been anyone in the room with him, they would not have heard it; the implanted transceiver fed directly into his nervous system, and took its instructions from his thoughts. He had lived with the implant for so long that it was part of him. He would have missed it if it did not work; but he had never liked it.

"THERE IS A MESSAGE FROM CERES," the voice said.

"IS SHE SAFE?" Aeneas thought. It was a ridiculous question; not even the base central computer had been given enough data to know who he meant. "CANCEL THAT QUESTION. HOW IS THE MESSAGE SIGNED?"

"HOTLIPS."

Thank God, Aeneas thought. He was careful not to think that into the computer. His prayers were not meant for a machine. "I WANT THE

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FULL TEXT AS A PRINT-OUT," he ordered. It would take a little longer, but he would rather read it than hear it. "DECODE AND PRINT. KEEP NO COPY IN MEMORY."

"ACKNOWLEDGED."

"ASK LAURIE JO TO COME TO ME."

—Pause—"DONE."

And now there was nothing to do but wait. He leaned back in the chair, smoothing his shock of white-gray hair with slender fingers. Even in Luna's low gravity he felt his years. He had been forty when he came to the Moon, and even though Lunar gravity did not age men as much as Earth's did, there had been little rest in the last quarter century. Not for Aeneas MacKenzie. Presently he began to doze. Images formed in his mind.

* * *

Economists once thought there could never be a period of both inflation and high unemployment. They were wrong. In the last third of the Twentieth Century both were normal conditions. With millions out of work, governments tried to buy their way to prosperity through deficit financing. They printed bonds and certificates and paper money and more paper money, and soon they were all worthless. Wages and prices spiraled. People who had saved all their lives found their savings worth nothing, less than nothing, and simply to live had to turn for aid to governments that had ruined them in the first place. The governments had to find more and more money, and the printing presses were cheap. The results were predictable, but no less disastrous for being so.

The democracies in particular faced an impossible dilemma. There wasn't enough money to fund both technological research and welfare programs. Technological research was expensive and directly employed comparatively few people. Soon the space programs were cut back, cut again, cut once more. Meanwhile the anti-technology movements gained recruits. "Only One Earth." "Alternate Technology." "Appropriate Technology." "Ecology." Those slogans and a dozen like them became watchwords, and space programs, energy research, electronics research, all began to die.

For a while private industries continued research programs, but soon the governments, desperate for more funds to spend on popular programs, raised taxes so high that there was nothing left for risk investment. The companies cut back as had the governments; especially so as the consumer advocates forced the corporations to accept consumer representatives on their boards of directors, and the consumer representatives were almost universally dedicated against technology and technological "fixes."

Then the United States was rocked by a series of scandals. Wa-

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tergate began it, but the scars from that had not healed before another scandal emerged, and another after that. The People's Alliance rose to displace the traditional political parties, and swept into Washington as an irresistible reform movement. Its leader, Greg Tolland, and his manager, Aeneas MacKenzie, were the most popular political figures of the Century; but then MacKenzie, as Solicitor General of the United States, found the tentacles of the Equity Trust reached even into Greg Tolland's office; and MacKenzie was both implacable and incorruptible. The result was more loss of confidence, more disgust with democracy, more disillusionment among voters who now believed that the citizens could never control their government.

While the United States was paralyzed by scandals, and the Soviet Union was rocked by nationalistic movements within its empire, a few international corporations banded together to create the first industrial satellites and the first laser-launching system. The heiress Laurie Jo Hansen built the *Heimdall* industrial satellite and that proved so profitable that other companies first joined with Hansen Enterprises, then set up competing space industries. Based in Zurich and Singapore and Hong Kong and other places of refuge from taxation, the international corporations moved into space even as governments found themselves unable to do so.

Governments looked with envy on the high profits and great potential of space industries. Tolland's lieutenant, Aeneas MacKenzie, led the fight for US takeover of the Hansen empire, ensnarling Hansen Enterprises in a web of legal problems, taxes, regulations, complexities; he might have ended with Hansen nationalized by the United States had not he found corruption in Tolland's staff, and been forced from his office by the President he had created. MacKenzie had to flee for his life; and he had no place to go but to his enemies. From Tolland's Washington MacKenzie went to Laurie Jo Hansen; and because he had known Laurie Jo many years before, and because she with the whole world knew that Aeneas MacKenzie's pledged word was worth more than his life, he became first her consort, then her prime minister, finally her partner.

Yet Tolland and the People's Alliance never forgot who had ruined Toland's dreams of a country remade by whatever means he thought were needed; his agents had been relentless in pursuit, until Laurie Jo sold out most of her empire to found Diana Station, and took her minister-consort to the Moon: Not even the President of the United States could follow them there.

* * *

And by now no one is interested in killing us, Aeneas thought. Except Greg, and he has no real

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power. The People's Alliance protected him from the scandals, but the real leadership doesn't trust him. Not any more.

The office door opened without warning and he swiveled quickly. After more than twenty years he loved the sight of her. The red hair was dyed now, he suspected, but he had never asked and never would; and despite all the temptations of low gravity, she had kept her figure. Her smile lit the office.

"She's safe," Laurie Jo said.

"For a while."

"Can't you ever simply be happy without worrying about the future?" She did not wait for an answer. Instead she crossed the office quickly and sat in his lap. They kissed with the affection that comes only from long friendship and love. Then Aeneas opened a desk drawer, took out papers from the computer printer concealed there and began to read.

Although she desperately wanted to know what the message said, she did not read over his shoulder, but waited until he had finished the first sheet. He handed it to her without looking up and read the next. There were only two. Then he waited until she had finished.

"They're on Ceres," Laurie Jo said. "With the cargo safe."

"And someone tried to kill her. At least twice. Someone knows," Aeneas said. He cursed, softly. "I'm a fool. I underestimated the danger."

"She knew the risks," Laurie Jo said. "And who else could we trust with something this important?"

"It was a stupid plan. I should never have let her go."

Laurie Jo laughed. "Could you have stopped her?" she demanded. "No one could control *us* at her age, and she believes in this. You could not have stopped me when I was her age."

"God knows I couldn't."

It had been so long ago. She'd been Laurie Jo Preston then, an orphan girl living alone under the guardianship of bankers and supported by trust funds. They'd met at UCLA when Aeneas was political manager for Greg Tolland. No one had ever heard of Greg Tolland then. The young Congressman, just beginning his meteoric career, was one of the founders of the tiny movement that would one day be the People's Alliance, but then it was nothing more than a dream shared by Tolland and Aeneas.

Aeneas and Laurie Jo Preston had two years. They lived together and hitchhiked across the nation, through Mexico and Baja. They sang and drank and made love and were happy with their dreams until her bankers came to tell her that her name was Hansen, not Preston, and that she had inherited one of the largest fortunes on Earth; then everything changed. "I couldn't control you, and I almost lost you forever," Aeneas said.

"Hush." She put a finger gently

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on his lips, then bent to kiss him again.

"I miss her," Aeneas said.

"I have missed her terribly from the day she decided to go to Earth," Laurie Jo said. "But I'm proud of her."

"And so am I. Laurie Jo, I feel so helpless! Someone knows. If they tried to kill her once, they'll try again. Before she even left Earth! And she didn't tell us."

"Because we would have stopped her."

"It doesn't make sense," Aeneas said. "They tried to kill her before she ever got to the ship. And they tried to stop the ship from landing on Ceres. That makes no sense at all! We hadn't expected trouble before she got to Ceres. They need that cargo as much as we do—"

"My darling husband," Laurie Jo said. "Use your brains. You're letting this be too personal—"

"How could it be otherwise?"

"—and you're making mistakes because of that. Someone wants to stop the ship from landing. They tried. Perhaps it was Pacifico—have you asked for his dossier?"

"Presently. Not yet."

"More likely someone else," Laurie Jo said. "But whoever it was didn't want *Wayfarer* to land at all. We hadn't expected that."

"No." Aeneas leaned back in his high-backed chair and pressed the tips of his fingers together. His eyes half closed, and his hands pressed gently together, drew apart, pressed together again.

Laurie Jo smiled as she watched him. This was more to her liking. This was the man who had brought down a President.

"So there's another group working in the Belt," Aeneas said.

"You don't sound surprised."

"With billions at stake, I would not be surprised if everyone in the Belt were corrupt," Aeneas said. "How many can resist that kind of temptation? When it is quite feasible to offer bribes in the millions and still make fabulous profits? I expect this was done by the Africans. They don't fancy competition from asteroid mines."

"I don't much blame them," Laurie Jo said. There was sadness in her voice. "They don't have anything to sell except their minerals, and we're driving the price down and down."

Aeneas nodded. They'd discussed all this before. Ruin for the African bloc meant prosperity for the rest of the world; cheap iron and steel and copper and aluminum, the basic stuff of industrial civilization, would let billions live well who now had no hope at all. Eventually it would mean prosperity for the Africans themselves, but not soon, and not for those who now controlled the African bloc.

"So we are facing two sets of enemies," Laurie Jo said.

"Probably more. At least two. One group wishes to stop the shipments altogether. I doubt they have

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finished. They'll keep trying, but they won't have many allies in the Belt. It's the others I worry about—and George Lange is dead. She won't have his help." Aeneas leaned back again, his hands moving slowly and gently.

Laurie Jo waited. "VALKYRIE STATUS REPORT." The words formed in her head with no accent, but she always knew when she heard Aeneas speak to the computer, although she could not have told how that was different from hearing the computer report to her.

"READY FOR DEPARTURE IN FIVE HUNDRED HOURS," the computer told them.

"EARLIEST POSSIBLE ARRIVAL TIME ON CERES?"

"ONE HUNDRED AND TWENTY DAYS FROM PRESENT TIME."

"With Lange dead, we'll have to send someone else," Aeneas said.

"Who? There's no one we can trust with something this important. And neither of us can go. Nothing has changed, Aeneas. We're needed here. If we lose control now, there's no point to any of this. We'll lose everything we've worked hard for."

"I know. We can only trust ourselves. Or the boy. Or we could give it all up."

"Neither of us will."

"No. Neither of us will."

She didn't care for the tone he had used, and she looked at him sternly. He was leaning back again, his fingers moving in the familiar pattern that she knew meant he was lost in thought; and she was frightened even before he spoke again.

"There's a better way," he said. "The boy's more valuable here."

"*No*." Her voice rose. "I lost you for sixteen years once! And then almost lost you again, when we'd just found each other. I will not be separated from you again. I will not."

"Laurie Jo." His voice was very calm now. "You can manage the finances. You're better at it than I am, and you *must* stay here; but I've outgrown my usefulness."

"That's not true, you're the base commander—"

"A function that Kit Penrose can fill as well as I can," Aeneas said. "And Kit can train young Aeneas, who will be far more useful here than floundering around out in the Belt. He's not ready for this, Laurie Jo. I don't think our daughter was ready either, but I know our son isn't. He can help you, yes. He understands boardroom tactics, and he's becoming a better engineer than Kit, but he does not know intrigue and corruption. Not yet."

"Nor do you!" she shouted.

"Now really, Laurie Jo—"

"Aeneas, it has been twenty years since you were Solicitor General—"

"Laurie Jo." His voice was quiet and his tone calm.

"And I won't lose you again—"

"I am still a very careful man," Aeneas said. "There is not much

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risk to me—and I am less valuable than our son. We cannot risk both heirs. If it is a choice between myself and young Aeneas, there is no choice at all, nor would I be—" He stopped, because her face had changed.

She had lost her anger. Now her expression held only sadness.

"You know I'm right," he said. He was not insisting; he merely stated a fact they both understood. She nodded, then buried her face against his shoulder.

"I love you," she said. Then she tried once more, but only because she had to: "Couldn't Kit go? Or—"

"He couldn't, and there is no one else. Not for this. Is there?"

"No. You or our son."

"And thus me." He kissed her gently. "We have twenty days. And when I return, we'll have many more. I'll come back, Laurie Jo. I always have."

"Yes," she said, and she turned away from him quickly so that he would not see the glistening tears in her blue eyes.

XIII

Henri Stoire was a satisfied man, and what's more, he was certain he had every right to be pleased with himself. Since he'd come to Ceres as Interplanet's resident general manager, the output of the mines and refineries had tripled. The enormous mylar plastic mirror, over two kilometers in diameter, hung in synchronous orbit 760 kilometers above the asteroid, providing heat and light for the colony twenty-four hours a day (he still thought of days as having twenty-four hours even though Ceres rotates once each nine hours, five minutes). More miners arrived each month, the capacity of the refineries continued to expand, and a prospecting party had found a large vein of nearly pure water-ice deep under the surface, thus insuring both drinking water and reaction fuel for the nuclear ships like *Wayfarer*.

Henri Stoire was satisfied, but his superiors were not. His production goals were set in Zurich by men who knew nothing of the conditions on Ceres, but who knew a lot about international competition, manipulation of commodity futures, and always about banking and money; the goals they set were high. Of course, Henri thought, when he tried to be fair—not very often—the costs of the Ceres operation were very high as well. It took eleven new francs to get one kilogram from Earth's surface to Earth orbit, a hundred more to get it to Ceres, and Ceres required thousands of metric tonnes of supplies, food, equipment, and men, always more men. The return had to be high or the investment couldn't be justified.

Henri met their ever-increasing production goals, but his costs were always higher than estimated. No incentive bonuses for Stoire, not

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this year. Perhaps when a full cargo from the Belt reached Earth orbit . . . even iron ore delivered to Earth orbit would be highly valuable for more orbital factory construction. Iron in orbit would sell for almost Fr. 12,000 a metric tonne, and Henri had ten thousand tonnes to ship, along with one thousand tonnes of tin (Fr. 6,720,000), fifteen hundred tonnes of nearly pure silver (Fr. 315,000,000) and a few hundred million francs' worth of assorted other metals. The total value of the cargo he would shortly send down would be considerably more than half a billion francs; a respectable sum indeed. Now he had only to get the shipment to Earth. The incentive bonuses would follow.

Actually, Interplanet's bonuses interested Henri far less than his employers—or at least most of them—knew. True, Henri had enormous debts, the result of unwise speculations: had he known as much about the international commodity market as the men who set his production goals did, Henri would never have come to Ceres in the first place. His debts were further increased by Henri's unfortunate addiction to chemin-de-fer and roulette, and his even less fortunate tendency to borrow money from any source available. He had been born a rich man, of a great and wealthy family, and he had lost everything; he needed money.

Although Zurich's bonuses were not small by normal standards, Henri needed far more money than could be acquired by ordinary means. Had his employers known just how much money Henri owed, they would never have sent him to Ceres, or anywhere else; but his creditors were careful men who never advertised the names of those who borrowed from them; and they had many suggestions for Henri. There was no way, bonuses or not, that Henri could earn what he owed; but with any luck he would leave Ceres with his debts paid and more money than he had ever had in his life. If all that was merely a small part of the profits his creditors would make from his work, Henri was not an avaricious man. He truly believed that he asked for no more than he was entitled to, and certainly he had high abilities.

Henri was a small man, very neat in appearance. Even on Ceres he looked neat, and that was often very difficult. His small size was no handicap in space. In many ways it was a decided advantage. In low gravity long legs were mostly good for running into hard objects and otherwise getting in the way.

Though small, Henri was no weakling. He exercised daily and he was always willing to give the men a hand with a tough job. Henri could do the job of nearly any man in his employ; he took great pride in that, and it was certainly a useful ability. Some of his latest activities, those in favor of his creditors and

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unknown to his employers in Zurich, could not have been accomplished if Henri had not understood every detail of the automated refinery operation, known how to construct conveyor systems, dig out chambers in rock with explosives. . . .

Those skills, though needed, were not the key to his plan for resuming his place among the idle rich in Monte Carlo. More important than any of them was the study he had made of computer operations. That was the key to it all, and it had gone so smoothly that had Henri been a superstitious man, he might have been frightened.

Sometimes he was appalled by what he was doing. He felt no guilt about betraying the Directors of the Interplanet combine; if they paid him what he was worth, he would not have to resort to embezzlement (Henri preferred to think of it as misallocation of company resources, or even as a legitimate perquisite to his office). He felt no guilt, but he was sometimes disturbed by the sheer magnitude of the operation. Not only was something like one hundred million francs involved—and that was a large enough sum to impress even Henri Stoire—but also the follow-up implications would be even larger. Mankind had never succeeded in getting nuclear fusion to work on a commercial scale. Fission worked fine and had since the 1950's, but the far more valuable and efficient fusion proccess continued to be too expensive, too difficult; and the result was a continuing energy crisis that affected nearly every nation on Earth. Fertilizer prices depended on energy prices, which meant that energy prices controlled how much the poor would eat. Cheap fusion would bring cheap food—and Henri was turning fusion over to a gang of international criminals.

Still, he felt no guilt. If food was dear, it was because people were cheap. If the fools wished their children to eat well, let them either work to earn enough money or have fewer children. It was no concern of Henri's what happened to children in India, Bangla-Desh, Africa, South America. . . .

Nor was he worried about being caught. As manager for Interplanet he controlled the only police force on Ceres. The company guards worked for him and took his orders. The accountants reported to him and could only gain access to the computer through him. They could ask Interplanet's computer questions as long as they liked; even if they knew the real questions they should ask, it would not tell them without his authorization, and they didn't know anyway. Besides, in a few weeks it would all be over, and there would be no record of what Henri had done.

Henri Stoire sat at his desk, the only real desk on Ceres and a mark of his importance, and despite his satisfaction with himself and his

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work, he frowned as he read the report brought to him by Captain Greiner.

Wayfarer had arrived with cargo intact; excellent. But someone had tried to prevent the ship from coming to Ceres, and that was not. *Wayfarer*'s cargo was the key to everything. Without it they would never get all that iron and copper and tin and silver to Earth. Who had done this?

It took him only moments to dismiss Pacifico. The lawyer had been sent by Zurich, and was rumored to be a clever accountant as well. He would have been a nuisance, and it was as well that he was dead; but he had almost certainly not been responsible for nearly crippling *Wayfarer*. No. It was very likely that Pacifico's part was exactly what he had said it was, a frightened man trying to keep Captain Greiner from taking high risks with the ship.

Nor was it likely that the missing George Lange had been the saboteur. The Daedalus Corporation had far too much at stake, and they hired carefully. Daedalus was responsible for getting Henri's cargo safely back to Earth; the loss of one of their senior engineers would be inconvenient, possibly worse than that. All true. But Daedalus had a deeper role in this game. Henri's creditors had warned him that Daedalus, supposedly owned by other Zurich bankers and itself one of the stockholders in the consortium that created Interplanet, had its nose in far too many places. His creditors suspected that Daedalus worked for very powerful interests indeed—possibly even for MacKenzie and Hansen; that Daedalus engineers were often spies reporting to Interplanet stockholders, and whenever they were around, Henri should be careful. The warning was appreciated but not needed; Henri was always careful. But it made it unlikely that Lange had tried to sabotage *Wayfarer*. Far more probably Lange had been snooping around and had caught the saboteur, and was put outside the ship for his trouble.

So who might it be? Henri scanned the passenger and crew lists. Anyone might be an African sympathizer—Henri had already concluded the African bloc was the most likely sponsor of the sabotage—and that would not necessarily show in the kind of resumes sent out with passengers. Or the saboteur could be working for money. He lifted a microphone.

"READY," the computer said.

"I WANT COMPLETE DOSSIERS ON ALL PASSENGERS AND CREW ARRIVING ABOARD WAYFARER. HIGHEST PRIORITY REQUEST TO ZURICH HEADQUARTERS. JUSTIFICATION: NECESSITY TO IDENTIFY SABOTEUR."

"ACKNOWLEDGED."

He returned to his scrutiny of the passenger list. He read names and specialties, paying no particular at-

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tention to what he saw, until he came to "Norsedal, Jacob. Computer Specialist. To be supervisor of computer operations, Interplanet."

He read it again, then cursed. Zurich had not told him of this! True, he had requested a new programmer, but he was satisfied with his computer staff and its acting head. He had certainly not sent for any experts to take control; under his present arrangement Henri himself was the real supervisor of computer operations, and he liked it that way.

This could be bothersome, especially now. Did Zurich suspect something? He would have to be very careful with this Norsedal. Was Norsedal curious? An agent of Zurich? He must be watched closely. Henri continued to scan the list.

MacMillan, Ellen. Engineer, no employer. Henri smiled at that. Every ship brought two or three unemployed single women, and most claimed to be some kind of engineer. They might very well have their degrees, but generally they made a great deal more money in a far older occupation. He wondered where the MacMillan girl would go: to one of the established houses, or would she prey on the miners and prospectors and refinery workers from her own quarters? From curiosity he lifted the microphone again. "I WANT A PHOTOGRAPH OF ELLEN MACMILLAN, PASSENGER ON WAYFARER."

"ACKNOWLEDGED."

A few seconds later the facsimile emerged from a slot at the side of his desk. He looked it over, smiling at the blonde hair and blue eyes, pug nose; a pretty girl, young, one who would command a high price, for a while. Then the smile faded. Was there something familiar about the face? Where might he have seen it before?

No. He was certain he had never seen the girl. But she reminded him of someone. He did not know who, but it was disturbing. She reminded him of someone he feared. He laughed to himself, because he feared no one; but he kept the photograph and put a tick mark against her name on the list to remind him to take some care with her dossier when it arrived.

Henri Stoire was a careful man indeed.

XIV

Kevin wandered through rock corridors, not quite lost but not entirely sure of where he was. He was somewhere inside the Ceres complex and as long as he did not go through an airtight door, he couldn't be very far from the central area; but he was looking for Ellen and he didn't have any idea of where to find her.

When *Wayfarer* landed, the passengers had to help unload the ship and transfer cargo—most of the

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cargo, Kevin reminded himself. One compartment remained sealed. When Kevin's share of the work was over, many of the passengers had already gone inside. Kevin followed through the airlock doors, relieved to be off the harsh and barren surface of the asteroid. No one would say that Ceres was a pretty place, although the stars were spectacular; but Kevin had had enough stars to last him a long time.

Why had Ellen left without telling him where she was going? he wondered. He would have to report in for work soon, and they might not have much time together until he could find out where he would be stationed. Then they could arrange something more permanent.

The corridors shone. They had been painted with plastic to seal in air leaks, so that it was possible to move around inside the Ceres Station without a helmet. There were lights at intervals. Kevin hoped to see someone to ask directions from, but before he did, he came to a signpost.

It showed DAEDALUS CORPORATE OFFICES just one corridor down. Kevin went there eagerly. They could tell him where he would be staying.

There was an elderly man in the Daedalus Corporation offices. The offices themselves were merely two rooms cut in raw rock off the corridor. They were obviously little used; there was almost no furniture, and an automatic message-recording system was the only piece of large office equipment.

The man was well over fifty, with a network of red lines around his mouth and chin that betrayed long exposure to face masks. He had wrinkles at the corners of his eyes, and much gray in his hair. He frowned at Kevin. "You'll be Senecal."

"Yes."

"I'm John Eliot. Senior man for Daedalus out here. You got our other people with you?"

"No—"

"You should have. You're an engineer. It's your responsibility to look after non-professional employees. Now we'll have to go find them. We don't have much time. Time, Senecal, is the most valuable commodity in the Belt just now."

"Yes, sir. Look, Mr. Eliot—"

"Call me Johnny. We'll either be friends or you'll hate me before long, but either way, it works better if we use first names."

"Johnny. Yes, sir. I am Kevin."

vin."

"Yeah. I know. You were saying something?"

"Mr.—Johnny, this is my first job. I'm no professional. I'm just an engineering student, and the idea of my looking after people twice my age is funny. They wouldn't take orders from me."

"We'll see. Did they get on al right with Lange?"

"Yes, sir."

"Too bad about him," Eliot said

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"What happened, anyway?"

Kevin explained all he knew. "George just vanished," he finished. "Never did find him, no trace of him. Nothing."

"His stuff missing?"

"No," Kevin said. "Captain Greiner has it. He didn't know what to do with it."

"We'll collect it before we go up. May as well see to that, and to finding our workmen. You can leave that gear here."

"All right." Kevin set down the travel cases he carried and started to go out into the corridor.

"Nope," Eliot said. "Get your hat. Didn't they teach you that? First rule, never go *anywhere* without your helmet. We don't often have blowouts on Ceres, but it only takes one to kill you if you don't have your hat with you. Remember that."

"Yes, sir." Kevin retrieved his helmet, then thoughtfully put on his tool belt as well.

"Good," Eliot said. "Now let's go." He led the way through the bare rock corridor. "They'll probably be at Fat Jack's," Eliot said. "Most head there when they get off work or off a ship. Surprised you didn't get there first."

"I was hoping someone would tell me where I will be staying," Kevin said. "I didn't see any hotels—"

Eliot laughed. "Hell, you won't be staying on Ceres."

"Sir? Johnny? If we won't be staying on Ceres, where will we be?"

"Didn't Lange tell you anything?" Eliot demanded. "Don't you even know what you'll be working on?"

"No, sir. I asked once, and he said I'd find out in due time. But I never did."

Eliot laughed. "Well, that was the company's orders all right, but it's damn foolishness. Everybody on Ceres knows our big secret, not that it's anything to be secret about anyway. Daedalus is responsible for the delivery system to get cargo to Earth. We're building it. I expect Lange kept everything about that a big secret too?"

"Yes—"

"Okay. Up there about a thousand kilometers above Ceres there's a rock a couple of hundred meters in diameter. It's mostly nickel-iron, good stuff. We're busily mining out corridors and putting in life-support systems. When we're done, we'll pack it with all the refined minerals Interplanet has collected and take it home."

"Take a two-hundred-meter rock home? How?" Kevin demanded. "It must weigh five million tonnes—"

"Thirty million," Eliot said. "Hell, it's simple. We put hydrogen bombs at just the right place—have to calculate the center of gravity pretty carefully—and light 'em off. Do that a few times and we'll have that rock in just the right

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transfer orbit. Off she goes to Earth. Down there they do it again to stop it. No sweat." Eliot chuckled. He was obviously enjoying the look on Kevin's face. "Lange really didn't tell you, eh? Well, that's what we're up to. You brought the bombs with you, on *Wayfarer*. That's why everybody got so excited down here when we heard you were in trouble. Needed the H-bombs. Without 'em, we'd really have troubles. No other way to get all that stuff home."

"And somebody's going to ride this thing to Earth?" Kevin asked.

"Sure. Safest place around. There'll be a couple of hundred meters of nickel-iron and rock between the crew and the bombs—what could happen?"

That made sense, but Kevin still didn't like the idea much. "Are we supposed to be the crew?"

"Naw. Interplanet provides the crew. They wouldn't trust a half-billion francs' worth of cargo to anybody but their own people. Understand the manager, Mr. Stoire himself, is going. Guess I can't blame them much."

They moved on through the rock corridor. In Ceres's low gravity they couldn't walk, nor could they simply glide from place to place as they would in no gravity at all. Instead they moved in a series of bounds, like oversized kangaroos.

They came to a cross corridor, and Eliot turned down it. There were bright lights at the end, their glare contrasting with the dim light in the corridor. They heard sounds: shouting and singing. Happy sounds.

"That's Fat Jack's place," Eliot said. "Best bar on Ceres. Mainly because it's the only bar here. Pretty good place, though. You can get nearly anything you want. Not that you'll be here all that often."

Kevin had already thought of that. "Don't we get to come—down to Ceres?"

"Sure, the company provides recreation trips when we're caught up on the work. Don't cost that much to run the scooters."

It looked as if everyone who had come in *Wayfarer*, and half the permanent crew of Ceres, were packed into Fat Jack's. The proprietor was a burly man with no legs. When one of the newcomers asked why he hadn't gone back to Earth, the owner laughed.

"Sure, they'll pay my way back and give me a goddam pension, but I don't want it. What the hell use is a cripple on Earth? Out here I don't need legs." He waved to indicate the crowd in his saloon. "I make my own beer and whiskey and I get good prices. I've got a thousand friends. What do I want with Earth?"

The saloon consisted of a large chamber carved from rock, a few tables and booths, and one long bar running across the back of the room.

All the drinks were served in

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covered containers with straws, although most of the customers had learned the art of popping open the top, sucking out a drink, and closing it before their beer or whiskey drifted away.

Kevin pointed out the Daedalus employees, and Eliot went to round them up. While Kevin was waiting, Ellen came in. Bill Dykes was with her.

"Hi," Kevin shouted. He went over to them. "Glad I found you. They want me to go up to one of Ceres's moons—"

"C-4," Dykes said. "The one they're fitting up as a spaceship."

"Right. How did you know?" Kevin asked.

Dykes shrugged. "No secret what Daedalus does. Everybody on Ceres knows about the H-bombs. Wonder why they were so damn close-mouthed aboard *Wayfarer*?"

"Well, they *are* hydrogen bombs," Kevin said.

"Sure. And bombs can kill people. Lots of other ways to get killed out here. I need a drink. You, Ellie?"

"Yes, thank you."

Dykes went to fight his way to the bar.

"I get some recreation visits," Kevin said. "I won't see you often at first, only when I'm down. Where will you be staying?"

"I—I'll be staying with Bill," Ellen said.

It took Kevin a moment to understand what she had said. "In his—"

"Yes, I'll be living with him."

"But—damn it, he's old enough to be your father!" Kevin shouted. He wanted to say more: That at first she had put him off because she didn't want lasting attachments, and now they were lovers, and what was this? Bitterness made him say more: "I get it. He can pay you more than I can."

"It's none of your damned business," she said. She spoke loudly, so that many of the people in the bar could hear her. "You don't own me and you have no right to make judgments."

"No. I don't suppose I do," Kevin said. "Except—except that I thought we were friends."

"If you're my friend, you don't act much like it," Ellen said.

"Trouble, Ellie?" Dykes was back, without the drinks he'd gone after.

"Not really," she said.

"Kevin. Are you about ready to leave?" John Eliot called.

"Yes. I'll wait for you outside," Kevin said. He turned and left without looking at Ellen.

"Hell, this place is getting to be a drag," Bill Dykes said. His voice carried through the room and out to where Kevin stood. "Let's split and throw our own party."

"All right," Ellen giggled. It was obvious what kind of party Dykes had in mind. She followed the miner out. They came past Kevin, and as they did, Ellen said, very

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quietly, "Kevin. Please. I know you don't understand, but please trust me. And for God's sake, don't let anyone know I've said anything to you. Make people believe you hate me." With that she went on without looking back, and when Dykes made a loud ribald comment about Kevin, she laughed.

* * *

Ceres has five moons, if you can call small rocks a few hundred meters in diameter "moons." Three of them had been extensively mined, but two had been temporarily abandoned when better grades of ore were found on Ceres itself. The other one, C-4, was Kevin's home for the next few weeks.

There was plenty of work and not enough people to do it. First, the asteroid had to be surveyed to find the exact center of gravity. Once that was located, a pit was to be dug for the hydrogen bombs that would be used to turn the tiny moon into an enormous rocket ship. On the opposite side the Daedalus crew would carve out chambers for the crew to live in, more compartments for the gold and silver and copper and other refined metals produced on Ceres. Meanwhile, another crew would set up huge mirrors on C-4 and use those to concentrate sunlight so they could boil and refine the ores extracted from the planetoid. "No point in wasting anything," Eliot had said.

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When they were finished, C-4 would carry a cargo worth half a billion francs. In addition, the asteroid itself would be valuable—nearly ten million metric tonnes of nickel-iron which would end up in Earth orbit. Refineries there would extract the iron to use in space construction. Even the twenty million tonnes of rock would be useful in orbit. The asteroid could be used as a platform.

Kevin's job was installation of the life-support equipment for the flight crew. With the help of miners and a lot of mining machinery, he hollowed out the crew chambers, then sprayed them with a thick coating of plastic; when the plastic dried, the chambers were airtight. Airlock doors were machined from chunks of the moonlet itself, and set on hinges. Sometimes the whole structure reminded Kevin more of a series of bank vaults than a spaceship; everything was massive, and rather crudely made.

There were no work shifts, there was simply a job that had to be done. Eliot explained what was needed and was available for consultation. Otherwise he left Kevin alone. When one task was completed Eliot would check it out, then assign another.

Kevin found the job exacting, but it was important work, and everyone was enthusiastic about it. They were taking part in something that might change man's future.

"Think about it," Eliot said. "If we can get all of Earth's metals out here, they won't have to strip-mine on Earth. No pollution down there. You know, in fifty years Earth can be one big park, with all the industries out in space."

Kevin became lost in a maze of calculations: food, oxygen, and water consumption for a crew of two (with standby provision for three) on a trip four hundred days long; g stresses which the equipment would endure when the one-megaton H-bombs went off; finding stress seams in the nickel-iron moonlet so they could be reinforced. Slowly the "ship" began to look like something that could support human life, with fuel cells for electric power, caves of ice for water and cooling, telescopes and radar for finding the exact position; navigation computer, galley, bunk rooms—with a separate stateroom for each of the crew, there being no space limits at all.

Finally Eliot relented and took the work crew down to Ceres. They went in a scooter much like the one used to get from the Earth satellite to *Wayfarer*: an open framework with seats for the passengers, a baggage compartment, and a large kerosene-oxygen rocket engine. The scooters also had a navigation computer; C-4 moved around Ceres at more than a third of a kilometer each second, and the total velocity change needed to get from the "moon" to Ceres was more than eight hundred miles an hour. The

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transfer orbit was tricky.

Kevin talked with the scooter pilot in Fat Jack's after they arrived on Ceres.

"Yeah, sure, I could eyeball it," Hal Donnelly said. "But it'd be tough. Not like flying an airplane." Donnelly had once been a test pilot, and would be one of the crew accompanying C-4 on the long trip to Earth. "Airplanes have air to work with. You can turn a corner, or slow down. Scooter doesn't work that way."

Kevin wasn't really listening to the pilot. He was thinking about Ellen. There had been so much work on C-4 that he hadn't had much time to brood about her before—except when he was ready to go to sleep at night—but he had felt a quick excitement when Eliot announced they were going down to Ceres, and he hoped to see her. He didn't know what to say to her, but there had to be some way—

He didn't know how to ask about her. He was afraid of what he would hear. His fellow workers on C-4 had talked about the various prostitutes on Ceres, and although none of them had mentioned Ellen by name, they all assumed that any single woman who came out not under contract to one of the companies could have only one purpose in mind.

Why the hell was she living with Bill Dykes? She'd hardly spoken to Dykes on the ship. She certainly hadn't known him very well, yet she moved in with him her first day on Ceres. It didn't make sense.

Of course it makes sense, Kevin thought. She likes the guy and I just didn't know it. She's got every right to move in with anybody she wants to and you've got no call to be jealous about it. She said everything would be over when they got to Ceres. It was just a shipboard thing. He could tell himself that, but it didn't help.

"You haven't heard a damned thing I said," Hal Donnelly said. "You drink my liquor but you don't listen to me." The pilot was grinning slightly.

"Oh—uh, sorry," Kevin said.

"No sweat. I know what you need. I'm about to go looking for a little poon myself. I know a good house. Want to come along?"

The idea was not attractive. Kevin still hoped to meet Ellen. He knew that wasn't very reasonable, and that she was likely to be with someone else, but there was always a chance— "Thanks, Hal. Not just yet. I'll have a couple more."

The pilot shrugged. "Suit yourself. We lift out of here in thirty-four hours. Meet you here."

"Right. And thanks for the drink."

"'S okay. You'll get me one next time. Right now I've got a more urgent urge. . . ." Hal grinned again and left the bar.

And just what the hell am I doing here? Kevin wondered. I don't know anybody in this place. He or-

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dered another drink. The vacuum-distilled whiskey was rough and strong and cost too much. Kevin sipped at it disconsolately.

He didn't want to leave because Fat Jack's was the place where everyone came to find people. The recreation schedule for the C-4 crew was known and posted in Fat Jack's: If Ellen wanted to see him, she'd know where to find him.

Jacob Norsedal came into the bar. "Hello," he said. He took a place across from Kevin. There was no real need to sit in Ceres's low gravity, but the habit dies hard; and it is convenient to anchor yourself in one place. "I've been computing the trajectory your moonlet will take back to Earth."

"I'm still not sure this will work," Kevin said.

Norsedal looked surprised. "Of course it will. Think of it as a fusion spacedrive. Plenty of energy in a megaton. One million tons of TNT, ten-to-the-twenty-second ergs . . . ."

"I wasn't thinking about the energy," Kevin said. "It's the navigation. We can't really locate the center of gravity all that well—too much guesswork."

"Run it off," Norsedal said. He offered his belt computer. "Takes a lot of energy to get that much iron to rotate. So they're off a little—you've got little tamped-implosion kiloton bombs to correct that, and the rocket motors for fine adjustment."

"Yeah, I've seen the numbers," Kevin said. "It looks silly as hell, mounting big rocket engines on the ground. Big things." The four Saturn-sized rocket engines were mounted in a cruciform pattern, pointing away from the center of the cross. They would be used to turn C-4 in the right direction. "But it's still using *bombs*," Kevin said.

Norsedal shrugged. It was obvious that to him bombs were just another device to channel energy; it was doubtful that he thought of them as bombs at all, or even imagined the real devices. They were more input numbers into his equations, data to be fed into the computer. "Have you seen much of Ceres?" Jacob asked.

"No. I was only here a few hours after *Wayfarer* landed, and this is my first trip down since."

"Well, I know a good place to eat," Norsedal said. "The food in the Interplanet commissary is all right, but it's nothing to rave about. I can find some real steaks—"

"Steaks! Terrific. We've been eating reconstituted stew. And textured vegetable proteins. And—"

"Spare me those horrors," Norsedal said. He patted his ample belly. "If I had to eat that way, I'd waste to nothing. Come on, let's get a good dinner." He hustled Kevin out of the bar and off to one of the rock corridors.

Ceres was honeycombed with passages. Some were still used as working mines. Others were aban-

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doned mine shafts, now used as part of the living quarters. There were airlocks at intervals along the corridors.

Jacob led the way through a maze of passages, and soon they were a long way from the inhabited parts of Ceres Station.

"Where the hell are we going?" Kevin demanded.

"Short cut." Norsedal continued to scurry along. As he'd predicted when Kevin first met him, his weight and ungainly appearance were no handicaps in low gravity. They turned another corner and went upward. There was an airlock there.

Jacob came very close to Kevin and spoke softly, almost a whisper. "We're going outside now. Please, just follow me, and don't use your suit radio whatever you do."

"But—why?" Kevin kept his voice low to match Norsedal's.

"Will you trust me? It's important."

Kevin nodded. He'd known Norsedal through the whole trip out; whatever Jacob was doing, it wasn't dishonest. He put on his helmet.

Norsedal opened the airlock and they went through the double doors. It was night outside on Ceres, but the overhead synchronous satellite mirror left the surface bathed in light. Down in the crevasse where the airlock opened they could see only by starlight, and Norsedal did not use a flash. He led the way, Kevin following closely.

Then he turned into a cavern so deep that there was no light at all. He went on, downward, and turned a corner before he switched on a flash. Then he gestured, finger to lips, and went around another turn.

There was an inflatable shelter there with its own airlock. The outer door stood open. Jacob gestured toward it, then followed Kevin in. There was the hiss of pumps and the airlock chamber pressurized, then the inner door opened.

Ellen MacMillan was inside.

XV

"I don't think anyone noticed us leaving," Norsedal said. "But I'll have to get back quickly. I have to go on duty in the computer center."

Kevin hardly heard him. He was staring at Ellen. He thought she was lovely. "But—"

"We'll explain," she said. "I wanted to keep you out of this, Kevin, but I can't. I need help. Will you help me?"

"I'll try. But—"

"Yes. It's such a long story, I don't know where to begin," she said. "Kevin, I didn't come here to work as an engineer. Or to be a prostitute, either."

"I never thought that," Kevin said quickly.

"That's sweet of you. But I hope everybody else does," she said. "I'm really not very good at the se-

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cret-agent business. Kevin, I—I work for some of the owners of Interplanet. For Hansen Enterprises. They have a contract for all the Arthurium mined in the Belt."

Arthurium. One of the super-heavy elements. In the first quarter of the Twentieth Century scientists thought there were only ninety-two elements. Then the nuclear engineers discovered they could make plutonium, and californium, and a host of other elements heavier than uranium-92, but all the new elements were unstable. Finally a stable natural element, atomic number of 124, was discovered. In the years that followed other super-heavy elements were found, but only in trace amounts. The super-heavies were in the cores of planets, and planetary cores are hard to get to: thousands of miles underground.

Ceres was only a couple of hundred miles in radius, but had once been the core of a much larger planet: there were super-heavy elements in abundance. Abundance is a relative term, of course: The supers are still very rare, found only in fractions-of-a-percent concentration; but they were available, and the most valuable of all was Arthurium, a member of the Tin-Niobium family, with the property of being superconductive at temperatures far higher than any other known superconductors.

"And somebody is stealing the Arthurium," Jacob Norsedal said. "I'm sure of it."

"That's what I came out to look into," Ellen said. "When the manager here reported only a few kilograms of Arthurium had been extracted, we wondered. Understand, it might have been true. Arthurium is very rare. But from the original assay figures, we thought there should be hundreds of kilograms of Arthurium, and we—Hansen Enterprises—needs it. Hansen scientists think they can solve the fusion problem if they have enough!"

Kevin found a place to sit. The shelter wasn't well furnished; in fact it wasn't furnished at all; but there were several boxes of gear stacked at one end next to the pumps and air supply, and Kevin found a perch on them. He tried to digest the information he'd been given. Fusion power would be priceless. And Arthurium, the little that was known to exist, sold for over a hundred thousand francs per kilogram. Hundreds of millions of francs, perhaps billions, were at stake here.

"What do you want with me?" he asked. His voice was harsh.

"Why are you angry?" Ellen asked.

He didn't say anything.

"Dykes," Jacob Norsedal prompted.

"Oh." Ellen smiled. "Kevin, Bill Dykes has known my father for—since long before I was born. He worked for Hansen Enterprises on the Moon. When I needed a place to stay, I had to ask him, be-

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cause I was afraid someone here might suspect me, and I didn't want anyone else to get hurt. They killed George Lange, don't forget. I have no right to ask your help, but I don't know where else to go."

"You mean—" Kevin's grin was broad and sheepish. "And I almost drove myself crazy thinking about you and—"

"I'm sorry."

"I have to get back," Norsedal said. "If anyone asks, I'll say you didn't want steak after all and went to find a cat house. I doubt that anyone is interested in you, Kevin, but they might be and it's best to have a story."

"I must be stupid," Kevin said. "I don't know where you fit into this, Jacob."

"He's an honest man," Ellen said.

"I was hired by the Zurich office," Norsedal said. "And I'm supposed to report directly to them if I find anything wrong. Not that Zurich is suspicious of the management here, but with all that money at stake, they wanted an independent check—to make certain."

"Just as we did," Ellen said. "Only we were suspicious."

"And you found something?" Kevin asked.

"Yes." Norsedal nodded vigorously. "There are whole memory areas in the computer banks that I can't access. And the programs run too long. That means the computer is following instructions that don't appear in the flow diagrams. I haven't found out what's going on yet, but I think I will. I managed to get a print-out of the computer's core, all the instructions. They're in binary of course, so it takes time to analyze what I have, but I'm sure there are operations going on that don't appear in the log. Mining operations, for example."

"And in the refinery," Ellen said. "It wouldn't take much to cover up a few hundred kilograms missing among all the thousands of tons of rock they process, tons of gold they've extracted—"

"And the refinery is nearly automatic," Norsedal added. "I can use the computer to find out just who might be involved by analyzing the work schedules, but I've been afraid to do that until I know just who's been using it and for what. It might be programmed to tell whenever people ask that kind of question." Norsedal went to the airlock and squeezed through the narrow inner door. "Good luck." He closed the lock and started the pumps.

"How does he—why are you two working together?" Kevin asked. "Are you sure you can trust him?"

"Yes. Henri Stoire, the manager, sent for dossiers on all the passengers aboard *Wayfarer*. They came twenty hours ago, and Jacob had to pass them along—but he figured out who I am from my resumé sheets."

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"If he could, so can Stoire—"

"I know," Ellen said. She sounded worried. "That's why I'm here. I don't know what to do. Ever since Stoire got the dossiers, there's been no communication from Ceres to Earth. The equipment has malfunctioned, Stoire says—but Jacob says it hasn't."

"And who are you?" Kevin demanded.

"Do you really want to know—no. Please, Kevin. I don't want to tell you."

"All right." He went to her and held out his arms. After a moment she crossed the tiny distance that remained and kissed him.

"Not very passionate in these pressure suits," Ellen laughed.

"We could—"

She looked at him sharply.

"Oh, hell," he said. "You wanted my help. I won't complicate things by—Ellen, I think I've been in love with you for a long time. Damn it, I know I am. Why else would it have bothered me so much when I thought you were living with Bill Dykes, maybe being—"

She cut him off with another kiss. "We can talk about this later. And we will. We really will. But now—"

"What is it you need?"

"I have to set up communications to reach off Ceres," she said. "Everything happened so fast! I was here for weeks, and I didn't really learn anything. Bill Dykes thought there was something strange happening at the refinery, but he couldn't be sure. They're very careful who they let work there. I didn't really have anything to report, nothing solid to be suspicious about, until Jacob came to tell me about discrepancies he found in the computer log. Now I've got to get a message to the Moon."

"How?" Kevin demanded.

"Bill and Jacob got this equipment," she said. "Bill knew about this shelter, and Jacob was able to cover the communications gear by listing it as lost in the computer inventory. So we have enough electronics and power supply to set up a high-gain antenna and get off our message, only there's too much for me to do by myself. Jacob isn't very good at outside work and he'd be missed if he didn't show up. And Bill thinks they've been watching him ever since he began asking questions. A few hours ago they gave him a special overtime assignment, that's not unusual, and if he didn't take it, they'd know something was wrong—so I couldn't think of anyone to help, and Jacob knew the scooter would be down from C-4 and he went to find you and I hoped you would help me—"

"Shhh. Of course I'll help you." At that moment Kevin would have done anything for her, including digging a hole all the way through to the other side of Ceres. He decided that he liked being in love.

* * *

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The gear was heavy. Weight is not a very meaningful concept in gravity as low as Ceres's, but even in low gravity things have mass; large things are hard to start moving, and just as hard to stop. The surface of Ceres is rugged: the asteroid has been battered by collisions with other rocks for billions of years, and there is no atmosphere to smooth out the craters and crags the constant bombardment creates. Carrying several hundred pounds of equipment—even when it only "weighs" thirty pounds or so—is not easy.

Ellen had gotten from Bill Dykes a map of the area around Ceres Station itself, and Dykes had selected a plateau three kilometers away as the best location for the transmitter. It was cut off from the Station by high peaks, but had a good visibility to space. They struggled across the crags and craters with their enormous loads, using their flashlights sparingly, and not talking at all.

Despite the hard work, Kevin felt exuberant, filled with joy and love—and hatred for whomever was trying to thwart the development of fusion power. Kevin remembered the energy shortages in his childhood, and although he knew that what he had called poverty would have been fabulous wealth to much of the world, he could remember the hard times he had grown up in. Fusion could change much of that for the whole world, and it was in danger from selfish people who only wanted money.

They reached the plateau. Kevin came close to Ellen and put his helmet to hers. "We can't get this done without communication," he said.

"Yes. I guess we'll just have to risk using our suit radios at lowest power. I don't think anyone is looking for us. Why would they be?"

"No reason," Kevin said, but he worried anyway. They opened the cases and took out a collapsible antenna. The elements bolted together to form a large aprabolic dish which could be pointed toward Earth.

The work was maddening. Each nut and bolt seemed a live thing, ready to slip from their heavy gloves and fall to vanish in the deep shadows. Connectors and parts which would have been simple to work with inside with plenty of light became complex puzzles, shapes not recognizable from the instruction diagrams.

"Putting together Christmas toys," Ellen said as she searched for a large part that had somehow simply vanished in shadow although it couldn't be more than a meter away.

Eventually they got it done, and began to set up the telescope and quadrant they would use to point the antenna toward Earth's Moon.

"Earth's still below the horizon," Kevin said as they leveled the telescope platform. "I think we're going to make it. Ellen, tell me something."

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"Yes?"

"You didn't grow up in any orphanage. They don't assemble Christmas toys in foster homes and orphanages."

"Yes they—"

"And you said the first day I met you that your father—'Daddy' you called him—made you study gymnastics."

"Oh. I'd forgotten I told you that," she said. "We—I was distracted at the time." She laughed softly.

"So who are you?" Kevin asked.

"Oh come now, Mr. Senecal." The voice was a man's, cultured, and entirely strange to Kevin. Kevin jumped in a startled reaction and almost upset the telescope. "Haven't you guessed that yet? Allow me to introduce you to Miss Glenda Hansen-MacKenzie."

There were two men on the plateau with them. One held a small rifle, the other a pistol. "Please keep your hands where I can see them," the smaller intruder said. "Sorry to interrupt you, but I really don't want you sending messages to Earth. I'm glad we found you in time."

"Who the hell are you?" Kevin demanded.

"It's Henri Stoire," Ellen said.

"Good morning," Stoire said calmly. "Hal, get their tool belts, please."

"Yes, sir."

"Hal Donnelly?" Kevin said.

"Sad but true," the scooter pilot said. "Too bad you had to get mixed up in this, Kevin. And you owe me a drink, too." Donnelly moved expertly, his pistol held well out of reach, and took their tool belts.

"What are you going to do with us?" Ellen demanded.

"Well, now, that is a problem," Stoire said. "There is a great deal of money at stake here. A very great deal. I can hardly allow you to get in my way."

It's happening again, Kevin thought. It was exactly like the time in the alley when the muggers had taken his wallet. He felt violated, humiliated, helpless—and Ellen, no, her name is Glenda he thought irrelevantly, they'll kill her. He tensed, ready to jump at Donnelly. Maybe Glenda could get away if he tried—

"On the other hand, you are worth a great deal of money," Stoire said. "What would your mother and father pay to have you back safe? Our scheme is almost perfect, but we all know there are no perfect plans. Right, Hal?"

"I don't know, sir—"

"There is the sabotage group," Stoire said. "True, I believe I have identified their agent, but suppose I have not? If he were to stop C-4 from going on schedule, we would be left with nothing. It would do no great harm to have Miss Hansen-MacKenzie hidden away, ready to produce when needed. I expect Aeneas MacKenzie would not even

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be above getting all of us off scot free in exchange for his daughter. It never hurts to have insurance."

"Well, yes sir," Donnelly said. "If you put it that way. But where can we keep them?"

"I believe I have an idea," Stoire said. He moved closer to Donnelly and they spoke helmet to helmet for a moment.

"Right. Come on, let's go," Donnelly said. "That way." He pointed with his flash. "And don't try anything, all right? I got nothing against either one of you. But I'll sure as hell shoot if I have to. There's just too much riding on this."

"How did you—how did you find us?" Glenda demanded.

Stoire's voice was maddeningly calm in their headsets. "When I first looked at your photograph, you reminded me of someone," he said. "I could not think who, although I have an excellent memory for faces. It concerned me sufficiently that I made a careful study of your dossier. An intriguing document. Carefully done. Really good work. But a few minor discrepancies. Your medical profile shows excellent physical condition, perfect teeth. Is that usual for foundlings? I do not think so. And the education you claim in your dossier does not match the abilities you showed aboard *Wayfarer*. A few other such things, all minor in themselves, but enough to make me think again. Where had I seen a blond woman who frightened me? And then I remembered. I met your mother many years ago, at least thirty years. She was blond then and was not so shy of having her photograph taken. A remarkably lovely woman, your mother. And you very much resemble the way she looked in the days before she married your father."

"Down there," Hal said. "Take that trail. And go slow."

"But how did you find us?" Glenda demanded.

"Ah. Once I knew who you were, it was obvious that I would have to question your, ah, lover. Mr. Dykes was most uncooperative, but he is not security minded. There was a copy of a map, marked, in his quarters. It took no great ability to go on from there."

They reached a wide ravine and started down into it.

"I don't suppose you would like to tell me how much you have found out," Stoire said.

"Go to hell," Kevin told him.

"Be polite." Stoire's voice had a hard edge. "So far I have been as gentle as possible under the circumstances. You can be made to talk, Senecal, and you are expendable. I point out that we have more air in our tanks than you have in yours. We need only wait. For that matter, I expect you would tell us anything to spare the young lady the ordeal of our questioning—"

"Kevin, don't say anything!" Glenda shouted.

"But you see, it doesn't really

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matter what you know," Stoire said. "I have Dykes, and we have drugs. It will not be necessary to question you two, which is as well for you."

They reached the bottom of the ravine. There was a scooter there. "Get on," Hal said. He took wire from his tool kit and bound Kevin and Glenda to the scooter seats. "All right, sir, I can handle them," the pilot said.

"Undoubtedly," Stoire said. "But—I think I will accompany you. Miss Hansen-MacKenzie is not above offering bribes—"

"I know better," the pilot insisted.

"Of course you do. Still, I think we will both be happier if we know we can trust each other—and the ride should be entertaining." Stoire climbed onto the scooter seat. "Let's go."

XVI

The pilot came around and turned off their transmitters. He left the receivers on. "Okay, kids," he said. Hang on." He climbed into the saddle and ignited the rocket motor. The scooter rose swiftly from Ceres. The pilot studied the plot in his navigation screen, then made careful course corrections. They moved rapidly away from Ceres, out into the black depths of space.

Kevin leaned toward Glenda. Their helmets touched. "It looks like he's taking us up to C-4," Kevin said. "That doesn't make sense."

"Kevin, we've got to get loose—"

"Sure. How?" He strained against the wire that held him. Nothing gave. "I can't do anything. And Stoire's watching—"

"I don't know what to do either."

"I love you."

"Kevin, I'm—do you really think they meant it? Where could he be taking us? I think they're going to dump us in space."

"They want you as a hostage," Kevin said. He tried to sound more confident than he felt.

And yet, he thought, it made sense. If there was a place Stoire could keep her, it could be important to have Glenda Hansen-MacKenzie on tap. MacKenzie's reputation was known all over the world. If he made a promise—or a threat—he'd keep it. What might he do to get his daughter back? But it didn't make sense to keep Kevin Senecal alive. . . .

* * *

There was a stony rock a hundred meters in diameter just ahead. It was smaller than C-4. There were signs of mining on it, but no lights or people. It looked deserted.

Donnelly carefully maneuvered the scooter toward the rock, and finally set it down. "Well, here you

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are," he said. "Your new home."

"Where are we?" Kevin asked.

"C-2," Stoire said. "Abandoned three thousand hours ago. There was enough equipment left here to keep you alive. Food, oxygen, fuel cells. We will take your suits and radios—"

"Do you really want to do that, sir?" Donnelly asked. "May as well kill them and be done with it. Their radios won't reach Ceres, and they will probably have to make outside repairs. If you want them alive, you'd better leave them their suits."

"All right," Stoire said.

"Of course, there aren't any scooters here," Donnelly said. He came around with a pair of wire cutters. He clipped the wires holding Kevin's left hand to the scooter, then pulled Kevin's hands together and took a turn of wire around them. Then he did the same to Glenda before he cut them free from the scooter.

"There," he said. "I'll leave your tool kits, too. You'll get loose with a little work. The airlock's right over there. Now, off you go. Go on, jump. Move. Get going."

They jumped off the scooter.

"Careful how you wiggle around," Donnelly said. "You can jump right off this rock. Won't do you any good except to kill you, of course, but you can do it. 'Bye." He started the scooter engine.

"*Au revoir*," Henri Stoire said. "Actually, I expect that's a misstatement. I do not think we will meet again." The scooter moved rapidly away.

Kevin found the wire cutters in his tool kit and helped Glenda free her hands. Then she cut him loose and they went to the airlock.

"Gauges show pressure," Glenda said. "I guess we really can live here."

"Sure." Kevin cycled the lock and they went inside. "We can stay alive, but—there's just no way we're going to get off this rock! We could be here for years."

* * *

They explored their prison. There wasn't much to see. A few hundred meters of tunnels sprayed with plastic to hold air; some chambers carved out as quarters; and gear left when the mining operations were suspended.

"There's a lot of valuable stuff here," Kevin said. "Surely someone will come back for it."

"When Henri Stoire orders it done," Glenda said bitterly. "It all belongs to Interplanet."

"Yeah." Kevin continued to check the equipment available. "There's mining stuff."

"So we mine the rocks, refine steel, and build a scooter," Glenda said. "Somehow I don't think that's going to work."

"No. I guess not." Kevin continued to wander. A small kitchen. Bathroom. "Hot showers," Kevin

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said bitterly. "All the comforts. And they weren't lying about food. Enough to keep us going for months. Not much variety, I'm afraid. TVP's. Dehydrated stew. Well, we won't starve."

They wouldn't run out of power either. There were tanks of hydrogen and oxygen, and a dozen fuel cells to produce electricity from them.

There was even a thick window set in the outer room of the mine. It looked down on Ceres. The tiny rock was locked in rotation with Ceres so that it always faced the asteroid below.

"So near and so far," Kevin said. "It might as well be a million instead of three hundred kilometers." He watched as they moved over Ceres. It would be simple enough to jump off their moonlet prison, but it would do no good: they would still be in orbit around Ceres.

Kevin took out his pocket computer. "C-2. We are 284 kilometers above the surface and we're moving at not quite three-tenths of a kilometer a second relative to Ceres. That's just about a thousand kilometers an hour."

"Which might as well be a million," Glenda said. "Damn. I have made a rather thorough mess of things, haven't I?"

"I'm worried about Jacob."

She nodded. "So am I. I haven't even dared think about him. Do—can they make Bill Dykes tell them that Jacob was helping us?"

"Given enough time, or the right drugs, anybody can be made to tell anything."

"And then they'll kill Bill and Jacob both." Glenda's voice was bitter and full of self-accusation. "It's my fault. I wanted to be certain. I wanted to find out where they had hidden the arthurium. Catch all the conspirators. Give the whole package to Aeneas, all wrapped up."

"You tried to get a message off. What more could you have done?" Kevin demanded.

"I don't know. I could have tried to get help. I think Dr. Vaagts would have believed me. Or Joe Harwitt. Westinghouse has a lot to lose—"

"Not if they're buying the Arthurium. And you can't know, Glenda. With this much at stake, anybody could be involved. Anybody at all."

"I know. That's what my father warned me about before I left. He didn't want me to come—"

"I don't blame him much."

"But I had to be so damned smart! And I've gotten my friends killed, and there's nothing I can do. I couldn't even get a message off!"

Kevin shrugged. "We did the best we could—"

"Did we? I didn't try everything. I could have sent something through the main computer."

Kevin frowned. "I suppose Jacob could have done that. It would have

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been dangerous. What we tried was better. A few more hours and we'd have done it. Or if Dykes hadn't left that marked map. . . ."

"Jacob had another plan," Ellen said. "He was working on the instructions Stoire gave the computer. Jacob thinks he can take control of the main computer away from Stoire. With just a little more work. Then we'd have been in control of the whole station."

"Yeah, but it has to work the first time," Kevin said. "All they need to do is keep Norsedal away from the control console."

"They couldn't keep me away," Glenda said. "If I knew the key commands, I could make the computer obey me. I should have waited, but no, I had to do things my way. Damn, I'm an idiot."

"Don't be so hard on yourself. How could you order their computer around?"

"Implant. I have a transceiver implant, and an acceptor was put into the Ceres main computer when it was built on Earth. It was supposed to be my secret weapon, but I never got a chance to use it."

"Implant." Kevin fell silent for a moment. "I'm told those cost half a million francs."

She didn't say anything.

"I keep forgetting. You have half a million francs. A lot more. What—how does it feel to grow up rich?" he asked.

"Confined. Filled with obligations if your father is Aeneas MacKenzie."

"Yeah, I guess it would be like that."

"I ran away from it," Glenda said. "Oh, not really. But I grew up on the Moon, and I was the little princess, and it was stifling. When I was fifteen, I convinced myself I couldn't stand it any longer. I went to Earth for an education." She shuddered. "It was terrible at first. Getting used to high gravity, to rain, and dust and storms and cars and freeways—terrible and magnificent too. Sailing. I learned to sail a boat. You can fly on the Moon, but you can't sail.

"So I went to school on Earth and I had this phoney identity, and I kidded myself I was independent, but of course I wasn't. I was still taking mother's money. And I was always afraid any boys I met would find out who I was and then they'd pretend to like me because I was the little princess—I was a mess, Kevin.

"I realized that finally, that I was worse off then ever because I was taking the benefits of being a Hansen-MacKenzie and I was shucking the responsibilities. So when I went back for a visit and heard about the Ceres operation and heard mother worrying about the small yields of Arthurium, I decided it was time to try to earn my keep."

"So it was all made up, about you and the foster homes, and the Futurians?"

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"Most of it. Not the Futurians. They're real, and I am a junior member of their Fellowship. I thought Aeneas would be upset about it, but he wasn't. He supports them, and they've helped us. They're one reason you're here, Kevin."

"How's that?"

"Dr. Farrington is one of the Fellowship. One of the leaders. After—when we were on the ship, I was curious about you, so I sent for more information. One of the messages I got back was from him. He thinks highly of you."

"But—why did you want to know more about me?"

"Do I have to tell you?" She moved closer to him. "Kevin, I'm afraid I've made a thorough mess of everything. I don't feel much like Miss Supercompetent Independence just now."

"And I'm one poor excuse for a hero," Kevin said. "But I do love you—"

"And you said so before you knew who I was. That's important," she said. And then they didn't talk at all for a long time.

* * *

The scooter came back thirty hours later. It didn't land. Instead it closed to a few dozen meters from their moonlet and a suited figure leaped off. As the scooter drove away again, the newcomer landed with a suit reaction pistol and came to the airlock.

"Jacob!" They let him in eagerly. "What happened?" Kevin demanded.

"They caught me," Norsedal sighed. "And it's worse than that. They killed your friend Dykes—"

"Oh no." Tears formed in Glenda's eyes.

"And Wiley Ralston," Norsedal said.

"Wiley? How was he mixed up in this?" Kevin asked.

"He was an agent for the African bloc," Norsedal said. "Stoire had him arrested and held a trial. Accused him of murdering you two, and George Lange. He was probably guilty of killing Lange, and he confessed to trying to kill the two of you when you were leaving Earth—"

"He was the saboteur on *Wayfarer*?" Kevin asked. "Wiley?"

"It looks that way," Jacob said. "He was executed for it."

"Damn," Kevin muttered. "There goes that chance. I was trying to see how Stoire intended to get away with it. I mean, the Hansen-MacKenzie heir can't just vanish! Aeneas MacKenzie would be out here with a shipload of Hansen security agents and blood in his eye—"

"And now he's got a scapegoat," Glenda said. "Dad will be suspicious, but—is there any evidence left?"

"There is now," Jacob said. "The computer still has a record of what happened. But Stoire will have

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done something about that before Mr. MacKenzie arrives. He is coming, by the way. There was a report that *Valkyrie* left Luna Station seven hundred hours ago. I wouldn't be surprised if he were bringing company police. But you've been reported dead and your murderer has been caught and executed."

"Looks pretty hopeless," Kevin said. "Unless you brought along a pocket scooter."

"Alas, no," Norsedal said. "They even took my computer."

"I don't understand why you're alive," Kevin said.

Jacob grinned slightly. "They're having some problems with the main computer just now. If they ever get them fixed, I'll be expendable, but they thought it might be best to have me around just in case they don't find the bugs."

"Will that stop them?" Glenda asked.

"Alas, no. Mr. Stoire is very clever. He'll figure out what I did, just as I finally figured out what he did."

"You know, then?" Kevin asked.

"Yes. Could I have some water?"

"Sure. There's plenty. Plenty of everything. We could be here for years," Kevin said.

"Not me." Norsedal's voice didn't change. "You see, they didn't leave me any insulin."

"How—how long?" Glenda asked after a while.

"If I'm careful about what I eat, three or four hundred hours," Jacob said. "Perhaps longer."

"We've got to get out of here," Glenda said.

"I agree, but I confess I don't know how," Norsedal said. "I was telling you what Stoire did. It was very clever, really. First he programmed the computer to report a much lower percentage of Arthurium in the ore. Understand, the computer knew better, and the refinery operated just the same as it always did, but the reported recovery was low. Then they told the computer to forget about one storage area, and routed ninety percent of the Arthurium there. Simple, clean, and really very pretty. And once Stoire erases the real log, there'll be no record of it at all."

* * *

They had explored every tunnel in the prison a dozen times, but found nothing. A hundred hours passed.

There was nothing they could do. No laser equipment to send signals with. No electronics. Nothing but some mining gear and the basic materials for staying alive. Even that took a lot of work. The algae in the tank farms had died, and their only power source was fuel cells. There were tanks of hydrogen and oxygen for those, but the carbon dioxide scrubbers needed constant recharging. They had less time

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than Kevin had thought.

"I would say two people have a thousand hours more oxygen," Norsedal said. "I could—" He hesitated. "I can add a couple of hundred hours to that, and it won't really matter."

"I'll be damned if you will," Kevin said. "Something will turn up."

"I doubt it," Jacob said. "C-4 is scheduled to go in about nine hundred hours. Daedalus is putting in the final equipment right now."

"And then Stoire and Donnelly are gone," Kevin said. "But how does he get away with it?"

Jacob shrugged. "It would be no great trick to put the Arthurium aboard C-4. As gold, for example. The bombs go off, C-4 heads for Earth. Somewhere between here and there a ship—it wouldn't have to be a very large one—meets them and when C-4 arrives in Earth orbit, the Arthurium is gone, with nothing left aboard that's not supposed to be here."

"And it would be stupid to leave us alive," Kevin said. "Once he's ready to leave, he'll come back with Donnelly and finish us. No evidence, no embarrassing bodies—"

"More likely he will take Glenda on C-4," Jacob said. "Donnelly is part of his crew."

"I'm going to go have another look around," Kevin said. "There's got to be *something* we can do."

"I hope you think of it," Glenda said. "I can't."

"Alas, nor I," Jacob added.

* * *

Kevin prowled through the corridors of their prison. There has to be some way, he told himself. Ceres mocked him from below, less than three hundred kilometers down. It hung huge in the night sky.

Three hundred kilometers down, and we're moving about half a kilometer a second relative to Ceres, Kevin thought. That's not very much velocity. Under a thousand miles an hour. It doesn't take much energy to get to that speed. How much gasoline does it take to accelerate a car on Earth up to a hundred miles an hour—a gallon or so? We only need ten times that, not even that much.

There's plenty of hydrogen and oxygen. Marvelous rocket fuels if we only had a rocket. More than enough to get us down, except that the temperature of hydrogen burning in oxygen is a lot hotter than anything we have to contain it in—

No. That's not right. The fuel cells do it. But they do it by slowing down the reaction, and they can't be turned into rocket engines.

He remembered the early German Rocket Society experiments described by Willy Ley. The Berliners had blown up more rockets than they flew, and they were only using gasoline, not hydrogen. Liquid-fuel rockets need big hairy pumps, and

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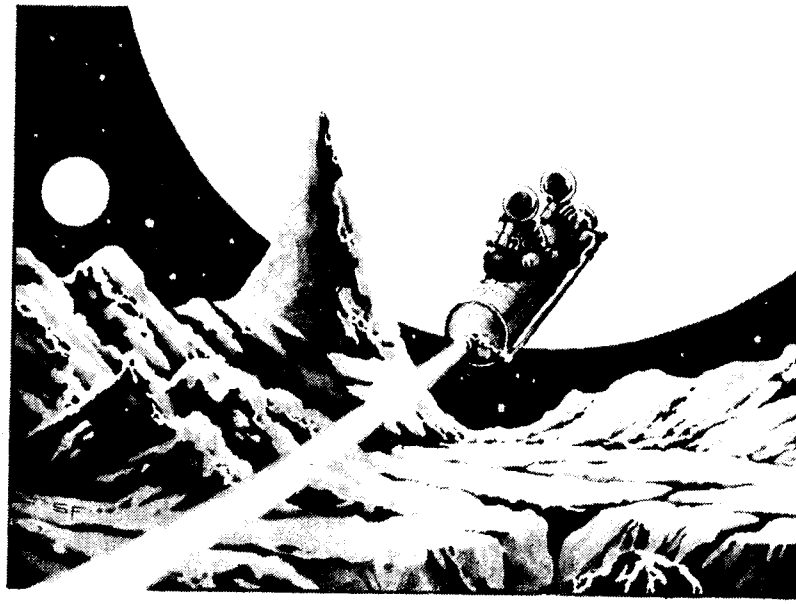

Kevin didn't have any pumps.

What did he have? Fuel cells, plenty of them, and so what? An electric-powered rocket was theoretically possible, but Kevin didn't have the faintest idea of how to build one, even if there was enough equipment around to do it with. He wasn't sure anyone had ever built one—certainly he couldn't.

Back to first principles, he thought. The only way to change velocity in space is with a rocket. What is a rocket? A machine for throwing mass overboard. The faster the mass thrown away goes in one direction, the faster the rocket will go in the other, and the less you have to throw. All rockets are no more than a means of spewing out mass in a narrow direction. A rocket could consist of a man sitting in a bucket and throwing rocks backward.

That might get a few feet per second velocity change, but so what? There simply wasn't enough power in human muscles—even if he did have a lot of rocks. Was there any other way to throw them? Not fast; and unless the thrown-away mass had a high velocity, the rocket wouldn't be any use. He went on through the tunnels, looking at each piece of equipment he found, trying to think of how it might be used.

You can throw *anything* overboard to make a rocket. Hydrogen

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for example. That's all *Wayfarer*'s engines did, heat up hydrogen and let it go out through the rocket nozzle. We have hydrogen under pressure—

Not enough. Nowhere near enough hydrogen and nowhere near enough pressure, not to get velocity changes of hundreds of miles an hour. Ditto for oxygen. Gas under compression just can't furnish enough energy. What would? Chemical energy; burning hydrogen in oxygen would do it, but it gave off too much; there was nothing to contain that reaction except the fuel cells and they did it by slowing the reaction way down and—

And I'm back where I started, Kevin thought. Plenty of energy in the fuel cells if I could find a way to use it. Could I heat a gas with electricity? Certainly, only how—

His eye fell on the hot-water tank in the crew quarters. An electric hot-water tank. There was a pressure gauge: forty pounds per square inch. Forty p.s.i.—He looked at the tank as if seeing it for the first time, then went running back to the others.

"Glenda, Jacob, I've got it."

XVII

Jacob Norsedal bent over Kevin's pocket calculator. "I have worked it by three different methods and I get nearly the same answer each way," he said. "I believe it will work."

"Sure it works." Kevin grinned. "Steam at forty p.s.i. will come out *fast*. About a kilometer a second."

"I believe you," Glenda said. "But it sounds silly. *Steam* rockets?"

Kevin shrugged. "It is silly. There are a lot more efficient systems. But this will work—"

"In a low g field," Jacob said. "You will not have much thrust. Of course you won't need much."

"I'm sure it works," Kevin said. "Now all we have to do is build it." He made himself sound confident; he knew how much room for error there was in his figures. "Look, it takes 980 calories to turn a gram of water into steam. We heat that steam up another thirty or forty degrees and let it out. The energy is moving molecules. We know the molecular weight of water, so we can figure the number of molecules in a gram and—"

"I worked it too," Glenda reminded him. "And I get the same answer you do, but it doesn't mean I trust it."

"What else can we do?" Kevin asked.

"Nothing. You're right. Let's get to work."

* * *

They disconnected the hot-water tank and drilled holes in it. Several turns of heating wire went through the holes, then they sealed them in with epoxy. At one end of the tank they drilled a large hole and threaded a pipe into it, threaded a large valve onto the pipe, and

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welded a makeshift rocket nozzle beyond that.

When it was done they tethered the tank and filled it with water, then connected a fuel cell to the heating leads. "Here goes," Kevin said. He threw the switch to start the heaters.

Slowly the water inside heated, then began to boil. The pressure shown on the gauge began to rise. In half an hour they had forty-five pounds of pressure. "All right, let's try it," Kevin said.

Glenda turned the valve to let out steam. A jet of steam and water shot out across the surface of the moonlet. Ice crystals formed in space and slowly settled to the rocket surface. The jet reached far away from them, well off the moonlet itself. The tank pulled against its tether lines, stretching the rope.

"It works!" Kevin shouted. "Damn it, we're going to make it!" He shut off the electricity. "Let's get her finished."

* * *

It didn't look like a spaceship. It didn't even resemble a scooter, crude as those were. It looked like a hot-water tank with fuel cells bolted onto it. For controls it had vanes set crosswise in the exhaust stream, spring-loaded to center, with two tillers, one for each vane; a valve to control steam flow; and switches to connect the fuel cells to the heaters. Nothing else.

The tank itself was fuzzy: They'd sprayed it with styrofoam, building it up in layers until they had nearly a foot of insulation. There were straps on opposite sides of the tank to hold two passengers on.

The tank held nearly a hundred gallons of water. Kevin calculated that they had more than enough energy to boil it all in their two fuel cells, and they would only need sixty gallons to get to Ceres. The number was so small that he ran it four times, but it was correct.

The strangest part was the stability system: a pair of wheels taken from a mining cart and set up in front of the water tank. Electric motors rotated the wheels in opposite directions.

"Damndest gyros in the history of space research," Kevin said when they got the ship completed. "In fact, it's the damndest rocket ever."

"It ought to have a name," Glenda said. "Something heroic, fitting a knight rescuing us from durance vile—"

"How about Fudgesicle?" Kevin suggested.

"You'll hurt its feelings," Glenda said.

"The Gump?" Norsedal asked apologetically.

"Stop that! *Galahad*. That will do nicely, I think."

"You're crazy," Kevin said.

Norsedal laughed. Glenda's own laugh was strained. "I'm about to get aboard that thing, and you say

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I'm crazy? And you built it? Kevin, are we ready?"

"I guess so. I've been putting off the awful moment, but—"

"Right. Come on, Jacob—"

Norsedal sighed. "I have been over the calculations. That Gump *cannot* carry three people. You will be lucky to get down alive with two. Therefore I am not coming."

"You have to!" Glenda insisted. "If you don't get down, it does us no good—"

"Not true," Norsedal said. "I've given you the key words. And you do not know where you will land. Now it's true that I get around better in low gravity than I ever did on Earth, but it is also true that I am not athletic. I doubt that I can make my way over hundreds of kilometers of ravines—not in my present condition."

"You're feeling the lack of insulin?" Kevin demanded.

"Yes," Norsedal sighed.

"One of us should stay with you—" Glenda said. She sounded doubtful.

"Nonsense. You must go, because Kevin could do nothing alone once he gets there. Kevin should go because it is more likely I will be rescued if you two get down safely, and two are more likely to succeed than one. Now, are you ready?"

"I guess so," Kevin said.

"Then let's do it before we lose our nerve," Glenda said.

"Right." The total mass of *Galahad* with full water tank was just under 550 kilograms. In C-2's tiny gravity it was no problem at all to carry it outside.

They stood on the rocky surface of the moonlet to let their eyes adjust to starlight. Ceres filled a full sixty degrees below them, a third of space, so close they could not even see all of it. It loomed huge and darkly forbidding, its surface lit by sunlight to a brightness much less than Earth's moon, but it was enormously larger than any full moon.

"We won't have any trouble finding it," Kevin said.

"No," Norsedal said. "But finding it is not your main problem."

"Don't I know it."

Glenda said nothing. All three of them had tried to work the problem of a landing orbit, and they couldn't do it with a pocket calculator. The equations for low-thrust trajectories were too complex, and they had too little data about *Galahad*'s probable performance. They would simply have to navigate by eye and hope to cancel out all their velocities.

They carried the hot-water tank to a low peak on the moonlet and pointed it so that the rocket nozzle was aimed as close to the direction they moved across Ceres's face as they could manage.

"Time," Kevin said.

"I'm scared—"

"I'm terrified," Kevin said. "But what choices have we? You know damned well Stoire and Donnelly will be back—"

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"Yes. Let's do it."

It took only a gentle effort to push the steam rocket away from the moonlet, but the cartwheel-gyros resisted any effort to turn it. Finally they got it oriented properly in space. Then they climbed aboard.

"Full head of steam," Kevin said. "Almost fifty pounds. Ready?"

"Ready—"

He twisted the steam valve. At first both steam and water were expelled from the tank, but as they began to accelerate, the water settled and the exhaust valve let out only steam. C-2 dropped away. They missed it. It was a prison, but a safe one; now they had only their makeshift steam rocket.

Galahad showed a tendency to tumble, but with the gyros resisting, they were able to control it with the steering vanes. A plume of steam shot from the tank, rapidly crystallizing into ice fog that engulfed them.

"Damn. That's going to make it hard to see," Kevin said. "Nothing we can do about it." He peered down toward Ceres. It didn't seem any closer. Jacob's farewell faded in their headsets.

Norsedal's calculations had shown that twenty minutes' thrust should be enough to cancel all their orbital velocity. It would use up just about half their fuel. Once *Galahad* was stopped dead in orbit above Ceres, they would fall toward the asteroid, and they would have half their steam left to counteract that.

The trouble was that Jacob couldn't calculate how high above Ceres they would be when the twenty minutes were finished. As they lost velocity, they would lose altitude, and their orbit would no longer be a smooth circle, but an ellipse intersecting Ceres—somewhere. At the end of twenty minutes Kevin cut the power off. He was pleased that they still had thirty pounds of steam pressure.

After half an hour they were noticeably closer to the asteroid. It was time to start the steam again. They had to change direction of thrust many times, using the steering vanes to turn the tank. It was easy to over-correct and they wasted steam in swaying back and forth hunting for the correct orientation. Mostly, though, there was nothing to do but wait and hope.

As they came closer, they could see details on the craggy surface below. Rugged canyons, high peaks, deep valleys, and rocks everywhere. Kevin had a protractor which he used to measure the angle Ceres filled in the space below them. Then he used that to calculate their altitude. It was crude and certainly not accurate to better than ten percent, but it was all they had.

"I read a hundred degrees," Kevin said. "That puts us just about a hundred kilometers above Ceres. If I've figured everything right, and if I'm reading the angles right—"

"You have to be right, don't you?" Glenda said. "There's noth-

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ing else we can do."

She was right. They couldn't get back to C-2 now, and they wouldn't be able to find the tiny moonlet even if they had the reaction mass.

"Time for another turn," Kevin said. "I think."

"We're still moving—"

"Yes, but that's what the numbers say."

"All right."

And a year ago I was working equations in school, Kevin thought. Numbers to crunch and write down for examinations. Now they're something to stake your life on. He twisted the tiller slightly. The tank rotated, and he pointed the tiller the other way to stop it. It took several more adjustments before he thought he had it right. Now the steam jet pointed almost directly toward Ceres, counteracting the asteroid's pull.

He was tempted to change the steam flow, but he didn't dare. That was the part he couldn't calculate at all. The mass of their tank changed constantly as steam spewed out, and as the mass fell, the thrust increased. If they turned the steam valve up too high, it would more than counteract Ceres's gravity, and they would move away from it; and when they ran out of steam, they would fall again, this time with no stopping, impacting at seven or eight hundred miles an hour.

"I feel like singing," Kevin shouted. "I am I, Don Quixote, the Lord of La Mancha, my destiny calls and I go—"

"Which makes me Rosalinda, the scullery maid?" Glenda demanded.

"You would rather be Sancho Panza? —No, that's Jacob. And *Galahad* is our charger. Now I need a broken lance and a bent sword—"

"I think we're getting closer."

"So do I." Kevin took out his protractor and eyeballed the size of Ceres below. They could no longer see much of the asteroid; they were low enough that there was a definite horizon less than 150 kilometers to each side. "When we get closer, we have to kill our velocity relative to the ground. Otherwise the landing impact will kill us."

"Where will we hit . . . I mean land?"

"I don't know. Fifty, seventy-five kilometers from the station, I hope. We brought plenty of spare air tanks."

For a long time they had seemed to be falling very slowly. Now, as they got closer, they seemed to be moving faster. Much too fast. Kevin couldn't estimate their speed, but it was many meters per second. He used the tillers to turn *Galahad* directly toward Ceres, opened the steam valve wider.

Not too wide, he told himself. Not too wide, or we'll use up steam too fast and—

The temptation to blast as hard as they could was almost irresistible. The craggy ground came up toward them at frightening speed. They were definitely coming down too

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fast, and they were too close. Desperately he opened the steam valve all the way, and switched full power to the heaters—

A minute went by. Another. Now they were very low—and they didn't seem to have much approach velocity, but they were moving across the surface much too quickly. Painfully they rotated the tank until the exhaust pointed in the direction they moved over the ground, then tilted it again towards Ceres. Kevin opened the steam valve again.

"We've still got pressure," he said. "But I have no idea how much water is left in the tank—"

"Don't talk about it," Glenda said grimly. "We're so close—"

"Sure." Now they were less than a kilometer high, still moving too fast. Again Kevin rotated toward Ceres, ignoring their lateral velocity to kill their falling speed. "Keep a lookout for large objects in our path—"

"I'd say we're moving fifty miles an hour," Glenda said.

"Enough to kill you—" But slowly the rocket lost velocity toward the ground, and they were able to turn again. "Pick a landing site," Kevin said. "Something under our ground track."

"Over there. Ahead of us." He looked quickly toward the plateau she had selected. It was rocky but as good as anything else in sight. He rotated the rocket again; they were moving slantwise toward the ground, and Kevin kept the exhaust pointing straight in their direction of travel.

The steam pressure was falling. They were running out of water, or else they were using steam faster than the fuel cells could boil the water; it didn't matter. A few more seconds and they'd be down, one way or another—

The plateau came up toward them, but not so fast now. The steam valve was wide open. Nothing else they could do.

They were over the plateau and falling directly toward it, a hundred meters high and falling—plummeting straight down.

"Cut loose from the straps," Kevin shouted. "Be ready to jump clear just before we hit."

He worked frantically at the buckles, but he couldn't unfasten them and keep control of the tillers. The rocket showed a definite tendency to tumble now as Glenda moved in her perch, but there wasn't time for more talk, for more of anything—

Fifty meters. Twenty-five. Slowing all the time. Maybe they'd make it after all—

Then the ground came up and swatted them. They hit tail first. The rocket nozzle collapsed beneath, and steam spewed out, forming an ice fog that condensed on the rocks and on his face plate. He worked at the buckles and got them loose—

And realized he was lying on the surface. He couldn't see, but he

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heard Glenda's voice in his helmet. "Kevin! Are you all right?"

She didn't sound hurt. Gingerly he worked each limb. Nothing seemed broken. "We're down," he said.

Kevin estimated their landing velocity at about ten miles an hour. The crumpled rocket nozzle had absorbed much of the energy of the crash, and neither of them had been more than shaken up. "Any landing you walk away from is a good one," Kevin remembered a pilot had once told him. "Donnelly—"

"What?"

"Nothing. Something Donnelly told me once. When we were still friends. Glenda, I haven't the faintest idea of where we are."

"Sure you do. Why do you think we have visibility even though we're on the night side?" She pointed up at the bright disc above them. "The station is just under the synchronous mirror."

"Yeah. I'm not thinking too well—"

"You're doing all right." She pointed to the remains of their steam rocket. "Splendidly, I'd say."

They loaded up all the full oxygen tanks and set out toward the satellite mirror. Kevin stopped to take an observation with his protractor, then punched numbers into his calculator. "I make it ninety to a hundred kilometers," he said.

"Not too bad. A few hours of following yonder star. We've got enough air."

"If we don't use it up talking." Kevin started bounding across the surface of the asteroid. Glenda followed.

They moved in long leaps. It was much easier than walking, almost like ice skating or skipping down hill; as long as they could keep going in a straight line, it took very little effort. Turning or stopping was much harder.

They could leap crevasses up to forty meters wide, and it was easy enough to go around bigger ones. If they had to climb, they could jump thirty meters upward, or jump down steep slopes.

It was like a combination of flying and skating, leaping across the surface of Ceres, and Kevin shouted with the sheer joy of being alive. They *were* alive, and for a while they were safe.

In seven hours they were within sight of Ceres Station. They paused on a hilltop looking down on the leveled plain which served as the spaceport.

"We could try to steal one of the scooters," Kevin said. "I think we can trust John Eliot and the Daedalus people."

"Except that the scooters are guarded, and our best chance is the plan we already worked out. *Everyone* on Ceres can't be corrupt. Most of the people here believe in the future of the Belt—"

"All right," Kevin said. "Let's go."

They went directly to the main

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entrance to the station. There was no one in the airlock, and once inside, they went into Fat Jack's bar.

* * *

The bar was crowded with people singing and shouting. One by one they fell silent as they stared at Kevin and Glenda.

"You're dead," Joe Harwitt said. "Damn it, Bill Dykes said you were dead! He said you'd been killed by Ralston!"

"Did he say it to you?" Glenda asked. "Or to Henri Stoire and Hal Donnelly?"

There was a short silence. Then one of the miners said, "Hell, Stoire and Donnelly were the only ones with Bill when he died. You saying they lied to us?"

"Damn right," Kevin said. "They're the ones who marooned us on C-2."

"On C-2?" Joe Harwitt seemed to have difficulty comprehending that. "C-2?"

"Yes. Jacob is still up there."

"He's supposed to be dead, too," one of the miners said. "Supposed to have had some kind of fight with you, Senecal. What the hell's going on here?"

"Henri Stoire is stealing Interplanet blind," Kevin said.

"We'll find out about that," another miner said. "He's coming now."

Stoire came in with four armed company police. "What is happening—Miss MacMillan! We were

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told you were dead."

"Good act, Stoire, but it won't work," Kevin said.

"Have you gone mad?" Stoire asked. "What are you talking about?"

"He claims you've been doing some embezzling," Joe Harwitt said.

"And what have I been stealing?" Stoire asked.

"Arthurium," Kevin said.

"Nonsense. All the Arthurium is accounted for. "Six thousand, seven hundred and nine grams. No great amount, but more than has ever been seen on Earth—"

"It won't work," Glenda said. "I know precisely how much Arthurium was mined. Almost four hundred kilograms. And I know where it is."

"Ridiculous," Stoire said. "Young lady, I am trying to be patient with you and your impetuous friend, but it is obvious that you must be restrained for your own good." He turned to the others. "I don't know what she wants, but I do not have to listen to accusations from a common prostitute. Lieutenant, arrest those two."

"Yes, sir." The company police stepped forward.

"I'm no prostitute," Glenda said. "You know who I am, Mr. Stoire."

"Who?" Joe Harwitt demanded.

"I think I'll let someone else tell you," Glenda said. She looked at Stoire. "Does this mean anything to you? Balaclava, 17 September, 1976."

Stoire suddenly looked worried.

Glenda smiled faintly. "That's the code phrase he used in his secret transactions with the company's computer. Without it the computer won't deliver the full records. Jacob Norsedal figured it out from the machine language. And now—" She was quiet for a moment, a look of concentration on her face.

"HER NAME IS GLENDA HANSEN-MACKENZIE," the overhead speaker said.

"How the hell is she controlling your computer, Mr. Stoire?" one of the miners asked.

"Implant," Joe Harwitt said. "A rich young lady indeed. Only I never knew the computer could accept instructions from implants."

"Done in Zurich," Kevin said.

"Where is the missing Arthurium?" Glenda said aloud.

"I DO NOT HAVE THAT INFORMATION."

Stoire looked smug.

"How much was refined?" Glenda asked.

"THREE HUNDRED AND NINETY-TWO THOUSAND GRAMS."

"Four hundred kilos!" Joe Harwitt whistled. "Is there that much money in the whole solar system?"

"Enough that each one here can have one million francs," Henri Stoire said. "One million for each of you, if you help me."

"Jeez, that's a lot of money," someone said.

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"Where will you spend it?" Glenda asked. "I have already had the base computer send a message to Hansen headquarters on Luna. You shouldn't have 'fixed' the high-gain antenna, Stoire."

"Wait a minute." Harwitt looked from Glenda to Stoire. "I don't know what to make of this. You're saying that you and Laurie Jo Hansen's kid—"

"Hell, she is," Fat Jack said. The bar owner launched himself in a smooth curve that took him next to Glenda. He looked at her intently.

"Yep. I worked for Hansen Enterprises, twenty, twenty-five years ago now. She looks like the big boss did back then. Same eyes. Yeah, I think she is."

"Where is the Arthurium?" she demanded.

Stoire shrugged. "It appears that you know something I do not. I never knew there was any more."

"You're a liar," Kevin said.

Stoire shrugged. He turned to Glenda. "I really suggest that we go somewhere and talk quietly."

"Out here." She led the way to the corridor. Kevin and the others followed. The company police looked to someone, anyone, for orders.

Glenda and Stoire moved away from the crowd. Kevin was just close enough to hear.

"It really is simple," Stoire said. "If no excess Arthurium is ever found, there is no real evidence of any crime—"

"Kidnapping—"

He shrugged again. "Possibly. But the question is, do you want your superconductors? Because if any harm comes to me, you'll never see that Arthurium again."

"It's on C-4; we'll find it." Kevin said.

"Of course," Stoire said. "With a hydrogen bomb next to it. I doubt your superconductor would be much use after it is vaporized by a one-megaton bomb."

"You're bluffing," Kevin said.

Stoire smiled thinly. "You have reason to know I believe in insurance. This is another form. Now—shall we negotiate?"

XVIII

The H-bomb went off in silence. A bright flower of intolerable blue-white, dying to a dull red glow.

"Just off center," Jacob Norsedal said. He looked at the computer read-out. "They'll have no trouble correcting the slight tumble. The next detonation will go off on schedule."

Aeneas MacKenzie nodded. "So C-4 is on its way. I'm surprised you didn't go with them, Jacob."

Norsedal laughed. "Three's a crowd. Newlyweds don't need company, and they can certainly manage the navigation."

"Yes. I suppose they can," MacKenzie said. He glanced at the

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wreckage of *Galahad*. It hadn't been easy to find, but he'd offered ten thousand francs to the miner who could locate it. Laurie Jo would want to see it—and so had he. He still couldn't believe it had worked.

"Ingenious young man, my son-in-law," MacKenzie said.

"I've reason to know it," Norsedal said. "What will happen to Stoire?"

MacKenzie shook his head. "We'll pay his debts and send him home. I doubt he'll stay away from the gaming tables long."

"It seems a shame that he gets off so easily," Norsedal said.

MacKenzie's voice was gruff. "Bill Dykes was a good friend. I don't like it much that Stoire gets off, but I doubt Bill would have wanted to pay the price for vengeance. It would have been high."

"Yes," Norsedal said. "He had the entire cargo ready to blow. Arthurium, gold, all the refined metals—"

"And not even my wife could have put more money into space without some return," MacKenzie finished. "Yes. Glenda made the only deal possible. The human race advances, but sometimes we pay in strange coin, Jacob."

"Time," Norsedal said. The viewscreen flared again, a point of brilliant white fading rapidly. Norsedal studied the radar returns. "Well done," he said. He watched the computer read-out a moment longer, then looked up. "Will you be staying long?"

"No. I'm taking the Arthurium back to Luna in *Valkyrie*. We can be back months before C-4 arrives, and our fusion people are anxious to get to work. They think they may have a demonstration reactor by the time the kids arrive."

Norsedal typed inputs. The viewscreen blurred, then showed a map of the solar system and C-4's orbit from Ceres to Earth. "FOUR HUNDRED AND THREE DAYS," it announced.

"A long trip," Aeneas said.

"I doubt they'll notice." Norsedal's grin was wide.

Aeneas MacKenzie looked wistfully at the viewscreen. "Laurie Jo and I once had sixty days to ourselves. Sixty days with nothing to do but get to know each other. I think you're right, Jacob. They'll find this a short trip."

Norsedal grinned slightly and typed again.

"PROGNOSIS CONFIRMED," the computer announced. ★

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Editorial

IONS AND MICROWAVES

ABOUT A WEEK AGO, as of this writing, I was possessed of a concept for interplanetary-range propulsion at once startling in its implications and at the same time, once conceived, utterly obvious. So obvious, in fact, that initially I dismissed it on the grounds that if it were workable some specialist at JPL would have already proposed it—and NASA would be busy implementing it.

But six hours later (by now it was 5 A.M.) the idea was still itching: try as I might I could see no reason that it would not work. So later that day I placed a call to Dr. Robert Forward, a senior scientist of Hughes Laboratories, so that he might explain to me why, 'while the idea is certainly *interesting*, you understand, certain technical considerations make it totally unfeasible with present-day technology.' Imagine my surprise when, after a short pause, he thoughtfully replied, "Hmmm. . .that idea has been around for some time, but maybe the technology has advanced enough by now that it might work." Whereupon he furnished me with an equation and asked me to call back when I had the idea firmed up.

After a few calculations and considerable thought, I did call him back—several times, in fact. You are now reading the result. I would like to state quite clearly that without Bob Forward's assistance and encouragement this article would never have been written.

The idea is this: Since microwaves can be beamed from a transmitter to a receiver and then, via Schottky diodes, converted to electricity (recent tests over a 1.5 Km. distance achieved an efficiency of 82%—the combination of receiver and diodes is called a 'rectenna'), why not use microwaves to power a spaceship? Admittedly electricity, even in unlimited amount, does not

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of itself constitute a space drive: you still need mass to throw away; the faster you throw it, the faster you go. It happens that there is a method, utilizing electricity [see "Life Among the Asteroids," *A Step Farther Out, Galaxy,* July, 1976], for expelling mass very energetically indeed. By applying an electric charge to a metal (the best metal for this purpose is now thought to be mercury) that metal can be made into charged ions moving at velocities approaching that of light. In terms of reaction mass, ion propulsion is about sixty times better than the best chemical rocket fuel. Thus while the fuel-to-payload ratio (the "mass factor") for a chemically propelled mission from earth-orbit to the asteroid belt utilizing the most fuel-conservative orbit would be about a hundred to one, the same mission with an ion drive would require only as much reaction mass as payload (for this purpose I am referring to everything but reaction mass as 'payload').

The problem with all previously proposed ionic propulsion systems has been that the means for providing the electricity—generator-plus-fuel, solar panels, nuclear reactors, or whatever—have all been so massive that net thrust is comparatively miniscule, measured in fractions of a pound per drive-unit. However, if we can discard the generating equipment from our designs, the situation is radically altered. That, of course, is exactly what beaming power via microwaves would accomplish, replacing the generator and fuel for it with a receiving antenna and ancillary Schottky diodes for converting the microwaves to direct-current electricity.

The question arises at this point as to the relative masses of the rectenna and whatever generating equipment it replaces. To speculate meaningfully on that we need the aforementioned equation [with which Dr. Forward was kind enough to furnish me]. It is a very simple equation that tells how small a spot a lens (or in this case an antenna) can make at a distance; anyone who has read this far will find it not only comprehensible but rather fascinating.

What it says is that if the product of the diameter of the transmitter (d) and the receiver (D) equal twice the product of the distance between them (R) and the transmitted wavelength lambda) then reception efficiency will be almost 100%, since the receiver is the size of the spot made by the transmitter. Let's plug some numbers into dD = 2 R lambda.

First the distance between d and D. Since the nearest potentially exploitable (as opposed to interesting) trans-lunar area in the solar system is the asteroid belt, minimum effective distance should be on the order of three Astronomical Units, or approximately 4.5 times 10^8 (450 million) kilometers—about 279 million miles.

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$R = 4.5 \times 10^8$ kilometers.

Next, "lambda." I'm told that the most suitable wavelength for this purpose is two millimeters, which is 2×10^{-6} (or, .000002) kilometers. Lambda = 2×10^{-6} km.

This gives Dd = $2(4.5 \times 10^8$ km.) $(2 \times 10^{-6}$ km.) Dd = 1800 square km. The product of the diameter of the receiver and the transmitter must equal or exceed 1800 square kilometers; if the diameter of D and d are the same, then both must have a diameter of 42 km. for maximum efficiency. The following table shows (in kilometers) the inversely proportional relationship between d and D at three AU.

Transmitter (d)	Receiver (D)
10	180
100	18
1,000	1.8
10,000	.18
20,000	.09
40,000	.045

Clearly if the receiving antenna is to be more than a kilometer or two in diameter, we are talking science fiction, some new, ultra-light-mass kind of antenna as yet undevised or, for that matter, conceived. So let's look at the third line: if D is to equal 1.8 kilometers, then d must have a diameter of 1,000 kilometers. At first blush that is a very large transmitting area.

Actually, a one-thousand-kilometer transmitter is perfectly feasible. Unlike the receiving antenna, which must present a solid face of metal to the beam (any holes must be smaller than the wavelength), the transmitter need not be 'filled'; it need merely consist of about 100 unconnected transmitting elements that define its boundaries, the size of the elements themselves being determined solely by the engineering requirements of the desired beam power.

Certainly it would be possible to establish ten relatively small microwave transmitters that would encompass an area one thousand kilometers in diameter, or even five thousand kilometers, which latter figure gives a receiving antenna diameter of 360 meters. But another problem remains: the Earth's rotation; since we do not want to accidentally cook, or even lightly toast, passing aircraft, the beams will have to be pointed within a few degrees of vertical. Thus our transmitter would be operational for only a brief period each day, perhaps as little as one hour. Feasible, perhaps, but clearly undesirable as compared to a method enabling uninterrupted transmission.

An alternative is to orbit an array of solar-powered satellites. This would have the advantage of an extremely high value for d—so high that the diameter of the receiving antenna would be only about thirty meters! The objection to this method is the vast expanses of solar

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panels that would have to be lofted up and constructed in orbit, and the consequent huge expense. Although the cost might be in part offset by combining the project with a powersat feasibility study, the optimal method would be to combine ground-based generators with an orbiting array of microwave relay satellites; construction of such a system could be begun today with little or no prior R&D.

The system would be composed of a number of sixty-four-meter microwave relay stations in geosynchronous orbit, each with a ten-kilometer transmitting array directly beneath it. (It would require a cost-effectiveness study to determine if it would be desirable to design the ground transmitters to also beam directly to the ship antenna when in position to do so. While this would reduce the necessary number of both ground transmitters and orbital relays, it would increase the engineering complexity of the system considerably.) Using this method, the initial power source would be already extant commercial power plants, and the relay satellites would be small enough to orbit either by shuttle or by present launch facilities.

As I intimated previously, research in this area has been held back by the perceived necessity for extremely massive electrical generators and ancillary fuel, or large solar cell arrays that become less and less effective as they move away from the sun, as part of the propulsion system. Until such time as research is done that does not take that constraint into account, I am unable to speculate meaningfully as to precisely what the practical design limitations of such vehicles might be. Still, it is possible to make a few tentative deductions from the nature of the propulsion system itself.

First, since a rectenna designed for high efficiency at three AU need be only 100 meters across when coupled with an orbital transmitting array, it would seem that the size of the payload would be determined solely by mission requirements and construction costs.

Second, the system would be extremely flexible: since the ground transmitters and orbital relays would be permanent installations, the system could perform any number of missions at little additional cost. Indeed, several missions could be carried out simultaneously, either by beaming power alternately to each vehicle or by designing the system so that it could beam in more than one direction at once.

Third, in order to minimize structural support and consequent mass penalty for the rectenna, we can assume low constant acceleration; the crews of manned missions would experience some slight gravity for the entire trip. Furthermore, since the mass factor is so favorable, missions could be accomplished in a small fraction of what has previ-

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ously been regarded as minimum trip time. It might even prove *more* efficient to use "extra" reaction mass to get there more quickly in order to reduce the mass of the life-support system. Perhaps manned missions will be accomplished in two phases: first a "payload package" consisting of everything but crew and a few weeks life-support, would be sent out by most mass-conservative orbit, then, several months or even years later, the mission personnel follow, boosting out under high acceleration to the rendezvous point. (To take that idea a little further, a series of such packages could be sent out in low-acceleration orbits to strategic planets in a Manned Tour of the Solar System.)

There is another immediately obvious application of long-distance microwave power transmission: a major sticking point in the space-colony concept has been the design, transportation, and construction on the moon of a nuclear reactor with which to provide power for the mass-impeller (if the colonies are to prove economically feasible, both they and the power satellites that are their *raison d'etre* must be constructed almost entirely of lunar materials—the purpose of the mass-impeller is to throw that material to the L-1 point, from which it can easily be transported to where it will be needed). A low-mass, easily constructed rectenna would serve as well or better. ***Indeed, this method could be used to power installations anywhere in the solar system without the necessity for transporting massive generating equipment and fuel.***

Another, perhaps less obvious, application is in the nascent field of interstellar probes. While the establishment of an array of relay stations in solar orbit at one AU might be prohibitively costly when considered in isolation, as part of a space economy based on power satellites and long-distance microwave power transmission, the expense would be comparatively minor. It is interesting to note that such a two-AU diameter array would require a receiving antenna only 500 meters across for high-efficiency at a distance of four light years.

Of course, if the power satellite concept comes to fruition, in the long (or even fairly short) run the ground stations will become obsolete; our ion-drive spacecraft will be powered not by coal, or fission, or falling water, but, more appropriately, by sunlight harvested by power satellites that have been manufactured in space from material taken from the moon.

There is, however, one use for which ground-based power generation will remain essential: war satellites.

In the last few years there has been a great deal of speculation about orbiting massive lasers and particle accelerators for use both as a defence against ballistic missiles

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and against other satellites. Here, as with space drives, the problem has been the power source. Since powersats are large and visible—and therefore vulnerable—they are not suitable for use as an integral part of an anti-ballistic-missile system. For this purpose "hardened" or mobile ground arrays will be the order of the day.

The final application of microwave power transmittion that occurs to me (there are doubtless many others that have not) is in ground-to-orbit vehicles. For this purpose the rectenna would be built flush to the hull of the launch vehicle, and a series of small-diameter transmitting arrays would be placed down-range. The reaction mass could either be super-heated air or superheated steam. A steam-rocket might require somewhat more reaction mass than a chemical one, but water is both cheap and clean.

CONCLUSION

Will it really work? I do not know. I have listened to reservations ranging from the problem of keeping such a *very* wide array in phase to the difficulty ("impossibility" was the word used) of attaining the necessary degree of tracking precision over such distances, to questions concerning almost total loss of efficiency due to "side lobes." If my understanding is correct, the first two problems would be dealt with by means of direct feedback loops between individual transmitting elements and the receiver, while power loss would be a function of the square root of the number of transmitting elements: 10=1/3; 100=1/10; 1,000=1/100; etc.

Jerry Pournelle, perhaps the world's foremost pessimistic optimist, has taken the position that it might work but probably not nearly so well as the bare equation implies. As a "first chop" he has chosen to examine the implications of a two-kilometer rectenna. ["*Jim Baen and His Electric Spaceship*," indeed! Hrrmph.]

What I have proposed is not some sort of magical space drive, *a la* the Dean Device; the constraints of classical physics remain in full force: a spaceship still needs something to "push against"—and it still must take that something along. On the other hand, only one sixtieth as much reaction mass is needed by an ion rocket as by a chemical one to perform the same mission—if the ion rocket does not have to carry its power source.

A good historical analogy might be the replacement of oars by sails as the primary power-source for water craft. Just as muscle-powered vessels were by their nature restricted to brief, coast-hugging dashes, so chemically powered rockets are simply not good enough for large-scale missions of translunar scope. Just as sailing ships conquered the seas, so too will ion rockets conquer the solar system, and in so doing, open an era of material plenty here on earth. ★

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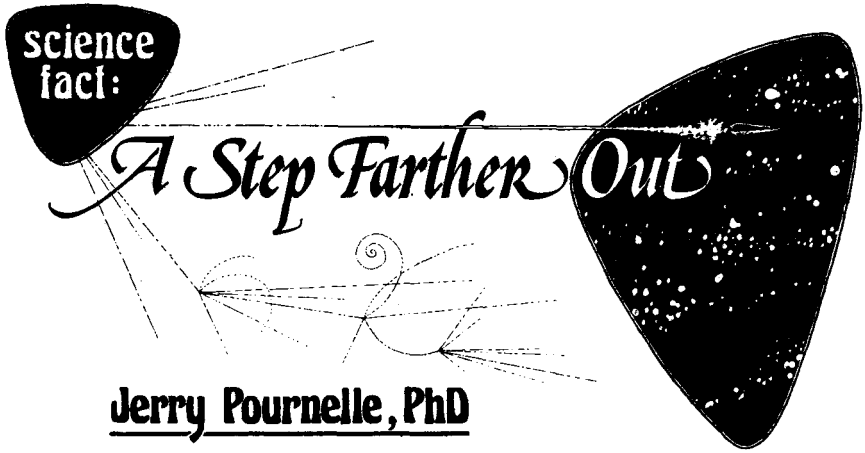

Jerry Pournelle, PhD

My friends, you will have to be indulgent this month. I will do my best to make this column both entertaining and informative, but I will admit in advance that I'm going to have to knock it out fast.

Why? Because this has been A Month. A rather good one for me, but very tightly packed. To begin with, I've had a lot of administrative and business work. *Lucifer's Hammer*, the latest by Niven and Pournelle (*Playboy Press, $10.00, and you'd better rush out for a first edition: they may not last—Ed.)*, had to be finished off. There was the auction of paperback rights (which went very well, but if you're waiting for a paperback, you may have a long wait); the sale of visual-arts rights; last-minute work on the galleys (very clean, since our publisher hired Jim Baen to "vet" the work of the in-house proofreaders, and a marvelous job he did, too, only Larry and I decided to insert two scenes and rewrite one in galley); telephone conferences; celebrations (the paperback and visual-arts sales went *very* well); and myriads of other details.

Mail. I appreciate mail, and I try to answer letters, but I can't do them all. I manage some kind of reply to those who enclose a self-addressed stamped envelope, and try to get off postcards to most others, but sometimes the unanswered letters reach archeological layers on my desk and the good fairies come in and remove them. I truly apologize to those who've written and received no reply; the list includes friends who have every right to expect an answer.

And now, as I'm trying to do my

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column, comes word that I'm appointed Associate Field Director (a courtesy title) of the Metropolitan Museum of Fine Arts, and must outfit a survey expedition to Guatemala for next week in company with Field Director Russell Seitz. The work is non-trivial. There is, it turns out, a technique for neutron activation which will allow one to determine from precisely which mine various precious and semi-precious stones were excavated. Applied to a number of Olmec pre-Colombian artifacts, the technique should tell us much about the migrations and trade patterns of those mysterious people; it remains to collect samples of serpentine and jadite from various locations, which requires the survey expedition this month (and probably another later.)

But that requires me to recover from my shots (about half the dread diseases afflicting mankind are now trying to establish themselves in my system; "Grab that germ and hold it tight! Leukocytes, antibodies, fight, fight, fight!") and to buy enough gear to turn my perfectly adequate-for-the-High-Sierra backpacking outfit into something that will let me survive in a tropical rain forest.

Add to that the requirement for me to attend a convention two days after returning from Guatemala, and the probable grand tour to promote *Lucifer's Hammer* next month, and you will see that I've had a busy month and have another ahead of me. Finally, Jim Baen has called several times to talk about the new space-exploitation system he's dreamed up, and wants a systems analysis of same, and here I am composing on the stick. Thus I truly beg indulgence.

* * *

A year or so ago I described ion-drive ships adequate for exploitation of the asteroid belt. They were very large; they had to be because they required megawatts of electric power. At the time I wrote that, I was perfectly aware that one could send electric power by microwave, and had described such systems in other columns. What I didn't do was combine the ideas: Why not an ion-drive ship which receives its power from a fixed source?

Alas, I never did put the ideas together; then, on a Sunday morning just after we had returned from church, came a frantic call from Jim Baen, who had done just that, and wanted to know if it would work, and whether it had been dreamed up before.

I didn't recall any previous mention, and my immediate reaction was, "It's so obvious, somebody must have thought of it and decided it wouldn't work", a common form of the "Not Invented Here" syndrome that plagues government, industry, research labs, universities, and damned near everything else.

Second thought was, "Why the hell not?"

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Third thought is this column. Unfortunately I lack some critical numbers, and so does everyone else I've checked with; the most important one missing is the mass of the receiving antenna to absorb the power densities required. "They're not heavy" is the best I can get from engineers who've worked on such systems; but they're thinking in terms of systems designed for emplacement on planets, particularly this one. But since we've only to design for rather low thrusts (you'll see why in a bit) and anything that will stand up to gravity and wind on Earth is certainly strong enough to withstand low thrusts in space, "They're not very heavy" may be information enough. Surely the receiving antenna cannot be massive compared to an onboard fusion generator. . . .

Let's look at some missions. First, supplying the men and equipment to build a Moon Base. We'll suppose ships that deliver 100,000 kilos of payload, and further assume parasitic mass of an additional 20%, giving us 120,000 kilos of ship and payload; to that we must add fuel and the antenna. Certainly, though, 100 metric tonnes at a shot is worth delivering; and since our ships will work equally well coming back as going up, we'll have opened up commerce with the Moon. It can lead to mines, construction of ships for exploitation of deep space, a host of activities—all worth thinking about.

Now the real advantage of ion rockets is that they give a truly humungous exhaust velocity, with a specific impulse of up to 20,000 seconds—compare that to the best chemical rockets which have perhaps 400, and the hydrogen-fuel fission engine NERVA which hoped for 1200, and you get the idea immediately. (For the basic equations for all this, see the column for April 1977, where I spell it all out.)

Cranking in conservative estimates for getting from Earth to Moon, and assuming we manage only specific impulse of half the theoretical value obtainable from ion rockets, we get a mass ratio of only—1.13, and that's something to get excited about. It means that the all-up mass of the ship with fuel is only 136,000 kilos—except that we've neglected the antenna.

Well, Jim gives the basic equation in his article elsewhere in this issue. Let's assume we construct here on Earth an antenna 5 kilometers in diameter, certainly not a difficult proposition; to get to the Moon we need only 300 meter antennae on our ships. That's a bit more than 70 million square centimeters of area; make it a centimeter thick, of solid copper (it must carry a large current density), and we come up with something more than six billion grams of antenna weight. That may be a bit much. Well, cut it to a half cm. thick (5 mm shouldn't be excessive for the currents we must carry) and assume

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that only 10% of the area will be filled with copper wire and insulation. That gives us 31 million grams, or 317,000 kilos. Add to it the original mass of the ship and we're up to 437,000 kilos; multiply by our mass ratio of 1.13, and the all-up mass is 493,440 kilos, which seems a lot—

Except that it's not. We're well under the mass of Saturn rockets—and we're putting a full quarter of that onto the Moon. More than that, the ship is re-usable. We've established that we're in a reasonable regime. Now let's refine.

The receiving antenna looks like a mess of bedsprings with diodes attached. The current densities are not really so large as indicated. On the other hand, we've totally neglected the mass of the engines to drive this. There are tradeoffs here: If we feed all this power into one big engine, the engine mass is negligible compared to the antenna mass; but the antenna mass goes up because of the power requirements. Let's redesign the ship to put a small ion engine at each 100 square meters, sticking them all over the antenna. That way no part of the antenna handles much current.

We now have 150 meter radius, 70,686 square meters, or 707 patches 100 meters square. Dr. Forward tells me the current Hughes ion engines mass about 17 pounds, roughly 7.7 kilos. All those engines together (neglecting piping, pumps, and other stuff) run us up to another 5.5 metric tons; now for the antenna itself. We'll assume one-millimeter copper wire covering 5% of the antenna area (and assume the diodes and electronics are included in that). Adding the nearly 32 metric tonnes of antenna to the engine mass, we get a grand total of 37,129 kilos for our power plant. Add to that the ship mass and we have 157,000 kilograms before we add fuel.

But now that we're working in the real world we find, alas, that Hughes has obtained at best a specific impulse of 1000. If we want to work on that to get it up to the 10,000 we assumed before, we may well add mass. Let's compromise and keep the ship mass figures, but recalculate the mass ratio using 5,000 for specific impulse. It still brings us to a mass ratio of only 1.5, so the all-up mass of ship and fuel is 236,000 kilos, about half what we figured in the first cut. Not bad.

Now what about power requirements? I've assumed a velocity change of roughly 20 kilometers a second; that is, I've assumed that the ion engines will carry the rocket from Earth surface to Lunar surface. That's likely to be excessive. It comes from having all that high-efficiency fuel system to play with. This thing very probably won't lift itself off the Earth, and so what? NERVA would never have lifted off from Earth, but it would be a perfectly adequate system for orbit-to-orbit missions, and this is a good

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deal more efficient than NERVA. (Or is it? We'll come to that in a minute.)

Obviously we must have something in excess of 1 g to lift from Earth. In fact, we need nothing more than 1.1 g to do the job, but let's assume 1.5 since anything going up more slowly has stability problems. There's a need to get the thing up high enough to let us beam power to it. We'll assume the world's longest extension cord for the first leg, until we've got that high.

To find the power needed, we need a number—how much thrust can you get for a kiloWatt? The old SPACE HANDBOOK says 2100 kW to get one pound. Bob Forward says Hughes Labs have achieved a pound thrust with 100 Kw, a much better figure. A pound of thrust will accelerate 1 pound of *weight* at 32 feet/second, and weight is a force, and one is supposed to convert to slugs, and that is the point where even after all these years I get confused. If we're lifting from Earth, though, we need not worry: We have 236,000 kilograms, which works out to 520,000 pounds of weight; it takes 100 kW to lift each pound, or 52 million kiloWatts just to hold it up. To get our ship actually to rise at 1.5 g, we'll need 78 million kiloWatts, and clearly we're not going to do it.

Our antenna just won't handle power densities of that order. Worse, it's just a lot of power, 52 thousand to 78 thousand megaWatts, and the biggest power plants we know of put out on the order of one or two thousand megaWatts. Most of the existing plants won't do anything like that.

Scratch the Earth-to-Moon shot powered by beam. It won't help a lot to reduce ship mass, either, because you will recall that much of that mass was the receiving antenna and ion engines, and the antenna size is fixed by the distances over which we must send the power.

Well, what about Earth orbit to the Moon, not attempting to lift ourselves out of a planet's gravity well? First, we aren't going to attempt to land on the Moon; even a sixth of that power density is still far too great. Is it worth building this system for Earth orbit to Lunar orbit?

Well, let's see. We can accept thrusts of .01 gravity, bringing our power requirements down to less than a thousand megaWatts, well within present capabilities (but that transmitting antenna is going to be big, hairy, and expensive). But how shall we land?

Well, we can get to orbit in chunks, chemical rockets, shuttles, nuclear ramjet first stages, laser systems, whatever; orbit-to-orbit with the beam-power ion rocket; and land at the other end with chemical shuttles. For comparison let's look at a NERVA system as the orbit-to-orbit craft. NERVA, you may recall, is a nuclear-fission pile

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through which one squirts hydrogen. Before the project was canceled, it achieved specific impulses of 600; it was designed for 800; and they hoped for 1200. Use the 800 figure on the ship we designed for this space mission; apply to our 120,000 kg. ship; we get a mass ratio of about 1.6, so the all-up mass of ship and fuel is 192 tonnes.

But of course we can't compare that to a ship designed to go Earth surface to Lunar surface, so we take our 120,000 kg ship, add the antenna, and get 157 tonnes; recalculate the mass ratio required for orbit-to-orbit operations (1.04), and discover that the all-up mass is 169 tonnes. Even with the parasitic mass of that antenna, we start with a lighter vehicle, meaning less gunk to get into orbit—and Baen's electric-powered spaceship is reusable, meaning we don't have to lift so much reaction mass into Earth orbit every time we want to send a cargo to the Moon.

I can't off-hand calculate the number of missions to breakeven, but let's look. Assume we get $20 per pound as cost to lift to orbit. We save 23,000 kilos per trip, 50,000 pounds, or a cool million bucks per mission. The installed cost per kW of a nuclear plant is in the order of $1,000. Assume we build a power plant to be used for Lunar missions (and thus assume that in off-hours we sell power to help defray costs of research and development of the ion ships, antennae, and the like), and we've a total cost of something like $800,000,000; trivial, in terms of Apollo or the Welfare budget, or the Interstate Highway project; and one assumes that the profits from sales of power will not be imaginary, since (neglecting legal and licensing fees, which drive the costs of power plants up to double and treble the actual costs) power plants are built at such costs in the expectation of making money.

Then there's another angle: We might want to build a power plant and transmitting antenna on the Moon. If we do that, we need not design ships to accept power over such long distances; at .01 g we need accelerate less than 8 hours to inject into proper orbit to reach the Moon, and we'll have travelled something less than 50,000 kilometers, making our antenna considerably smaller and lighter. At the other

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end the Lunar station provides the power to make orbit, after which Lunar shuttles come up to meet the ship—and since they need not have a payload of 100 tonnes, they might very well be powered by the Lunar transmitting antenna.

Fascinating. And immediately come other ideas. Using materials mined on the Moon and the Lunar transmitter, we could build cities in space (perhaps not at the L-5 point, which may not be optimal after all, but no matter; there are plenty of orbits).

Conclusion: Baen's electric-powered spaceships must be considered as contenders for exploitation of Lunar resources. They may not be the best thing available, but they cannot be ignored in cost comparisons.

* * *

Now what of deep space? There are problems. A 1.8 kilometer antenna/engine complex similar to that described for the Lunar orbit-to-orbit mission masses over a million kilograms, but I worry about power densities with very large antennae, and the problem of receiving power at an acute angle to thrust—that is, when you reach, say, Ceres, you must accelerate along a path more or less at right angles to a vector leading to Earth, and that could present problems, especially if your engines are mounted in various places on the antenna.

Then too there is the simple fact that such ships are truly dependent on the stations beaming power (boy, are there conflict stories in that thought!) and on scheduling and solar-system geometries; that negates the independence I postulated for the Belt civilization ships in my story, *Tinker*.

Then, too, do we need such large antennae? If everything works perfectly, perhaps not—but since in the real world that is seldom the case, let's assume we do. On the other hand, can we not work the problem as we did for the established Lunar base, with power stations on Mars, Ceres, the other asteroids we want to exploit? Earth then becomes just one more place in the solar system. To get from Ceres to Mars, you accept power from Ceres until you've reached the proper velocity, coast, and when approaching Mars, arrange to get power beamed up. Sure, you're dependent on someone at the arrival point, but then 747's are dependent on airports, and B-52's are dependent on in-flight refueling.

Given that concept, the numbers aren't a lot different from the Earth-Moon run. Remember the first of these columns? When you get into Earth (or Mars or any other) orbit, when you're independent of planetary gravity wells (called "holes" in Niven's 'known-space' series), you're halfway to anywhere; the velocity changes required to get to the sur-

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face of the Moon are not wildly different from those needed to get from Mars to the asteroid belt. Of course the coasting times are much greater.

But to return to the ship with the 1.8 kilometer antenna: The antenna itself, with ion engines attached, masses 1,329,022 kilograms, or 1329 tonnes. Add ship mass of another 50,000 tonnes, and multiply by the mass ratio, and we've got an all-up fueled weight in the order of 58,000 tonnes—and that's quite comparable to the masses I assumed for the larger ships in *Tinker*. In fact, as I recall the arrival payload mass of *Agamemnon* was precisely 58,000 tonnes. Once again the concept is not silly; it may well be competitive with on-board fusion devices.

Of course we don't know what on-board fusion systems will mass.

BULLETIN. I paused to open my mail, and Lo!, Gerald Yonas of Sandia Corporation announces that the US has achieved fusion neutrons from electron-beam inertial confinement fusion experiments. Another milestone along the development of fusion research—or, given Carter's budget cuts, a tombstone? An achievement of some importance, anyway.

What we've shown in the above is that there may very well be a place for Jim's electric-powered spacecraft in our future, provided that we can get to a future that includes space operations, or large

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electric power systems, or indeed much of anything besides out-door privies and insulated attics. Obviously a nation or corporation or world that builds such massive power plants and transmission systems is *committed* to exploitation of space; You don't put together anything that expensive just to go dig up a few rocks and bring them home.

As to whether the system would be the proper way to explore Mars and the asteroid belt—as opposed to the best method for routine travel between them once they are explored and transmitters and power plants are built at various locations—I doubt that anyone has enough data to do a definitive analysis. Certainly I don't; but any time you have a shot at a system that will give you specific impulses in the thousands, you can't possibly ignore it. In *Tinker* I solved the problem with on-board fusion power plants; Jim has come up with another contender.

I don't really care which of these is used, or whether either is. There is also the boron fission-fusion system mentioned in past columns. There's ORION, old bang-bang, which can put a couple of million pounds onto the Moon in one whack. There are other candidates.

What I do care is that we head that way, forget this "Only One Earth" nonsense, and realize that we live in a system of nine planets, 35 moons, a million asteroids; that we insure that no single act of a madman, no single accident, no single disaster, can wipe us all out; and the sooner we get to that, the better.

I see that I've lapsed into random thoughts. My problem is that I am all too aware of what I must do tomorrow: get down to the consulate for a visa, get better jungle boots, procure maps, buy out the local supplier of Cutter's Laboratory insect repellent, get silica gel for the cameras, call again about rental of a four-wheel drive vehicle; a myriad of details to be accomplished in a short time. I'd best get at it. When I have some harder numbers to play with, I'll take another cut at Jim Baen's Electric Spaceships and let you know. Meanwhile, whether this system is best or another is, it looks feasible—and that's one more proof that we don't *have* to huddle together on Earth and wait until we run out of resources.

We *can* get out there. We've only to decide that we should. ★

Note: I have just received the latest issue of the L-5 Society publication, and it's magnificent. This organization has become highly professional in the past year, and I recommend it to GALAXY readers—but the dues are a bit stiff, $20/year, $10 for students. They collect information on space colonies, and while a bit prejudiced against planets, do a lot of good. L-5 Society, 1620 N. Park Ave, Tucson, Ariz. 85719

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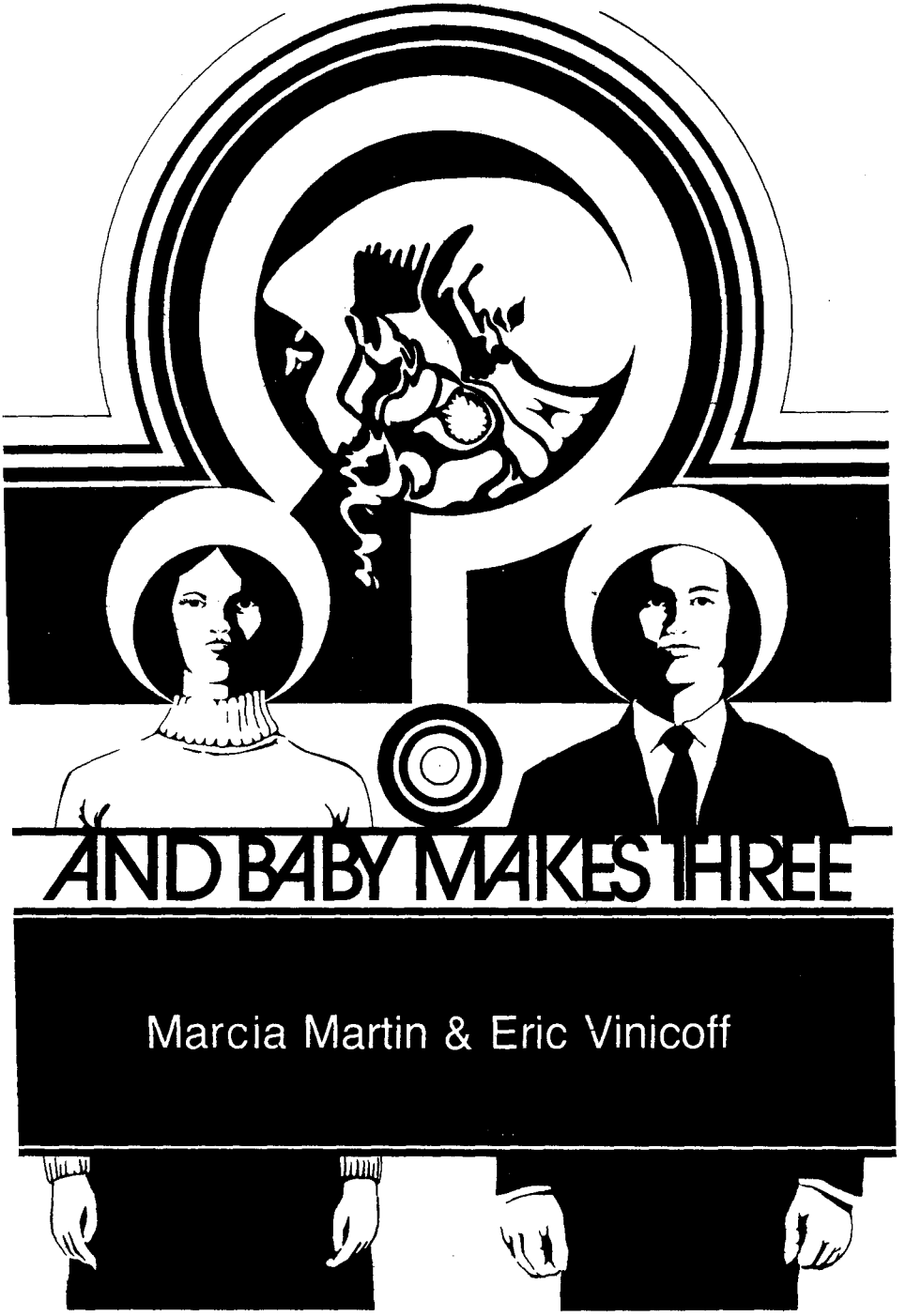

AND BABY MAKES THREE

Marcia Martin & Eric Vinicoff

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A Story of Planned Parenthood—but not the kind you think. . . .

the beginning

A SHORT RESPITE. Barbara lay on her back, legs in stirrups, covered with a blue drape. She looked around at the delivery room that had become her world: sterile, efficient, gleaming white plastic and chrome, completely at odds with the animal urge that drove her. Masked and gowned figures milled about. Even Neil beside her seemed unfamiliar.

"Okay, here we go again." The doctor intruded on her brief peace. "Push!" Neil and a nurse raised her back off the table as she took a deep breath. She pushed down as hard as she could, the blood pounding in her head, hands white from her grip on the handles.

Another breath. She dimly heard the doctor's, "Good, keep it up!" as the urge swept her on. Immense pressure shook her. She felt she was about to burst. But she kept going, driven to bring forth the life within her.

A third breath. Neil pressed her shoulders, and she managed to draw even more strength from somewhere, bearing down, down into a red haze.

"Barbara, stop pushing! Now pant! Pant! Here comes the head." The doctor worked swiftly and deftly, her fingers guiding the baby's head through to the world.

Barbara sank back gasping as the contractions ebbed. She felt like a sack of meal. Nine months of waiting were almost over. In a few minutes she would be a mother!

"Neil?" She reached out for him, and he held her hand.

"You're doing great, Barb." Neil's voice was exultant. "We're almost there."

"Once more, Barbara. A little push now." The doctor was blocking Barbara's view of the mirror in which she was supposed to be able to watch the birth. But she didn't care.

A last surge of power wracked her as she pushed down. She grunted. Then she felt the baby—like a slithering fish—slip down and out of her. Relief washed through her, and she started to cry.

"It's a boy!" Neil's voice broke. "Oh, Barb, love, you did fine!" He kissed her awkwardly through his mask, his forehead as red and sweaty as hers.

"Congratulations, both of you. Your baby is perfect—Apgar Ten—that's the best rating we give." The doctor was beaming at them.

She stepped around to join them, and Barbara saw Jason at last. He was small, pink and beautiful. He stopped crying as he was handed to

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Barbara. She cuddled him, free finally of the nameless terrors of deformity that had haunted her pregnancy. Handing him over to his proud father, she abruptly fell asleep.

* * *

"They've sprung it—damn them."

The Oval Office trembled with silence. The man seated across the desk from the President nodded. He was an ancient Texican with erect military posture. He had no official position in the government, but his authority was as real as it was pervasive. "I listen to the news too, Don. CIA was a month off. Which hardly matters now, of course. The question is—"

"I know what the question is." President Nivling leaned back in his chair, looking smaller, older and more tired than he did on TV. Behind him a pair of faded movie posters vied with the somber dignity of the room. He was frowning. "Let's take it short-term first."

"So?"

"First our stance. We downplay the whole Third World Resource Alliance concept. Too many chiefs. Someone will break the embargo, and it'll all fall apart."

"You buying any of that yourself?"

"Wish I did. They've got us by the balls." The President shook his head. "Dammit, we've seen this coming for years. And didn't do jack shit!"

"Congress wouldn't bite the bullet—never could see needs further down the road than the next election. And it isn't just us. The whole industrial world walked into this one."

"Maybe we thought we could trade technology for resources forever. But we're sure as hell being kissed off now."

"The Third World can do without?"

"Why not? We've built them up, given them enough base so they can pool for further development. They've finally caught on to the fact that there aren't enough resources for everyone. So guess who gets frozen out?"

"They're right," the man facing the President said coldly. "They just want to survive like the rest of us."

"Tell that to the people when the lights go out. How are we fixed for native resources?"

The man consulted a clipboard on his lap. "Summation: We have some of what we need, but not enough."

"Does Defense see a military option?"

"Sure. Thanks to proliferation of A-tech and limited-delivery systems, we can opt for the Last War."

"Thought as much," the President grunted. "I've been on the line to some of our more hot-headed al-

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lies all afternoon pointedly suggesting just that."

"Europe, eh. I don't see much of a future for them—no resources left."

"Too true. Fortunately the Soviets and Chinese weren't importing much. I think we can keep the international lid on. That leaves the folks we work for."

The man nodded. "We need a statement for immediate release. That should do until we get our answers down."

"Tell me something. Why did I ever get out of showbiz?"

"To save the country, of course. Start saving. We've got to crack this embargo fast."

The President turned and looked at the posters. "Or survive it."

* * *

year four

It was named Freedom Park of San Francisco.

Optimistically but, as it turned out, in bitter irony. It had been built by low bidders who used substandard materials and bribed inspectors. Then twenty years of uncaring tenants and shoddy upkeep had finished the job.

Neil trudged across the summer-brown ground between the unfinished concrete monoliths. In his exhaustion he was prone to reminisce. He recalled the tanker-routing career he had had at Standard Oil before the embargo. Even more painfully, he recalled the modest home on Mount Davidson they had owned—before.

They might have owned it still, but for the bills from having Jason. Hospital bills. Doctor bills. Food and clothing bills. Insurance bills. And on and on and on.

They might have been living there still. Instead they were here.

He climbed the stairs to the fifth floor and pounded on their apartment door. He identified himself, heard the locks unbolt, then went in.

Barbara kissed him, and he kissed back. Part of his bleakness lifted. "Everything okay?"

"Uh huh." She stood rigidly by the door. She had to almost shout to be heard—Jason was chasing a rubber ball around the small living room, shrilling his exuberance.

"No trouble?"

"If there was, I'd have said!"

A pause, then; "How'd the shopping go?"

"I wasn't hassled—not that there was much to rip off. Christ, you stink. Worse than usual."

"Tell me about it." He stripped and tossed his clothes into the hamper near the door. Then he collapsed on the ratty sofa. The weekdaily hike to and from the dump was rough on a man coming from soft executive life. He looked forward to the day their savings would buy a new chain for the bike. "I did pretty well today," he sighed. "Six dollars in bonus credit. I found

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some aluminum cans."

"They let you work the old piles?"

He nodded.

"That's—Jason, stop!" She rushed over and pulled him away from the lamp cord he was yanking on.

Nothing came free anymore, not even welfare. All able-bodied recipients had to work thirty hours a week at the nearest garbage-salvaging operation to get their benefits. Metals, plastics, wood and so on—all were recovered and sent to their respective industries for reuse. The remaining organic waste went to farms as fertilizer.

Barbara settled into his lap, and held Jason in hers. He groaned, but didn't complain. Jason was burbling, "Daddy home," again and again.

Neil tousled his light brown hair. "You have a good day?"

Jason nodded enthusiastically.

Something tore at Neil as he looked around the crowded living room that doubled as Jason's bedroom. Through an open door he could see the even smaller bedroom. It was a dump; windows cracked, infested with roaches, paper peeling, rugs rotting. Half the electrical equipment and plumbing didn't work, and couldn't be repaired for lack of parts (or money—the rich still managed to get by). How long could Jason's innocent pleasure in life survive such surroundings?

"Cheer up, pouty," Barbara said. "It's Friday—you've got the whole weekend to recover."

"Thank God for small—ouch, stop kicking, Jason—favors." But he smiled, and ran a hand down Barbara's back. Fortunately there were some pleasures beyond economics.

They left Jason to amuse himself with his ball, and adjourned to the bedroom.

In bed they could renew each other with pleasure and love reaffirmed. They found their primal focus, tuning out adversity and all else, even Jason. For a timeless time they rode the joy-save higher and higher, nearing the peak—

"Mommy! I'm thirsty!"

With almost explosive intensity Barbara threw herself off of Neil and whirled. Jason was standing at the foot of the bed. "I told you never to come in here when the door's shut without knocking!" she shouted.

Jason stumbled back into the living room, sheet-white, stunned.

Barbara collapsed next to Neil, sobbing and whispering, "I'm sorry," over and over.

Neil pulled her close. "What's the matter, Barb? Why did you blow like that?"

She turned a tear-damp face to him. "I . . .don't know. Something just . . . cut loose."

"Huh?"

Her crying gradually stopped, and she forced a wan smile. "It's been

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a bad day. I'm okay now."

"You sure?"

She nodded, then rose and slipped back into her dress.

"Where are you going?"

"To apologize to Jason. And try to explain. I must have hurt him a lot." Then her real smile returned. "Don't you dare move a muscle. I'll be right back."

Neil blew her a kiss. "You do that."

* * *

The meeting room was the largest on Capitol Hill, but it was filled to overflowing with spectators and clotted with media paraphernalia. Facing all of this, elevated and spotlit, the members of the Senate Ad Hoc Committee on Resources nervously tried to go about their business.

Senator Barrett was preparing his phraseology for his next question. A short man in his middle years, he wasn't very popular with either his fellow Senators or his party's hierarchy due to a curious unwillingness to compromise, and only remained in Washington because his constituents kept sending him back.

"Mister Buser, for the past few hours you've been bombarding this committee with GSA findings. I'm sure this committee would appreciate a brief summary. I would."

The witness was a tall young bureaucrat with ambition, well-dressed and self-conscious. "Frankly, Senator, we're in bad shape. Power and transportation are crippled by the oil shortage. Agriculture needs foreign nitrates for fertilizer. There isn't an industry that hasn't slowed or even stopped production. Our economy is grinding to a halt. Unemployment and crime are out of control."

Senator Barrett shook his head. "But what about the programs for alleviating the situation?"

"We've set up resource priority and rationing systems. We've mounted massive research to find or develop alternative materials. National Guard and military units are helping the police fight crime and rationing violations. And the waste processing operations are hitting their stride.

"But it isn't enough, Senator. There are too many people, too much unavoidable drain on resources. Practically all our stockpiles and reserves are gone."

"Has your department investigated the birth-control alternative?"

"Yes we have. If we could cut the birth rate by twenty percent at once, and hold at 140 million for the foreseeable future, we could live within our resource means."

"Theoretically, perhaps," said Senator Barrett. "It might even be the only solution. There's just one problem—the people won't have it. Not even to save the nation. Mister Gallup and Mister Harris presented quite convincing poll results yesterday. Does your department agree?"

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"We do. The fear of government control over the right to have children cuts even deeper than the fear of economic collapse."

"Why is that, Mister Buser?"

"There seem to be several reasons. Some feel it's immoral. Some feel it's unethical. Some feel it's unjust. Some worry about the corruption inherent in any large government program, the ability of wealth and position to buy this ultimate human commodity. Some just think it's too grotesque and different.

"But whatever the reason, Senator, you're right. They don't want it and they won't accept it."

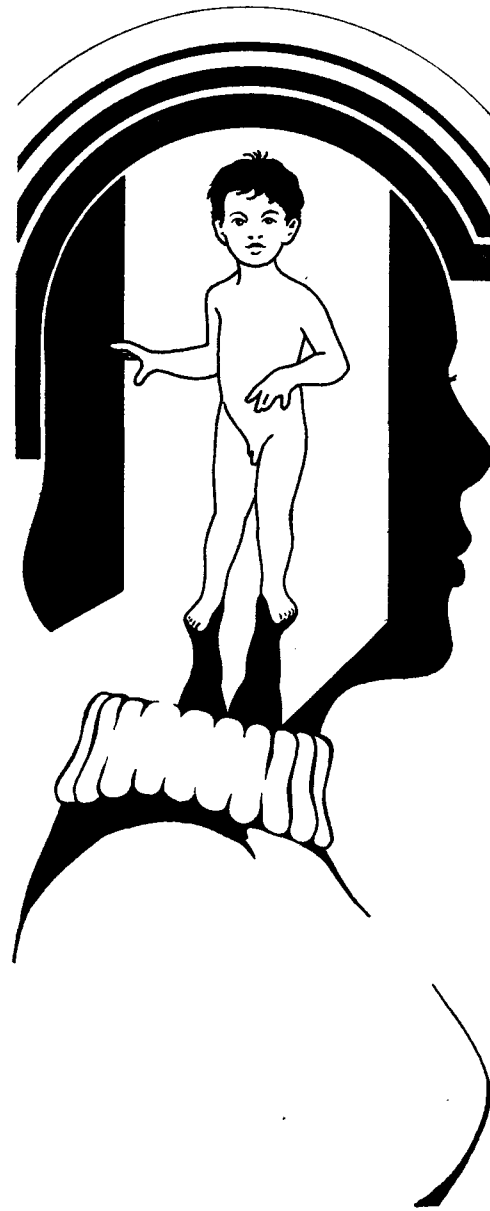
* * *

year seven

The free-clinic waiting room was crowded even this late at night, and smelled of human anxiety. But Neil and Barbara, huddled on a corner bench, didn't notice either the crowd or the reek. The old, sick and hurt milled around them; swearing, sobs and nervous chatter filled the air. A group of Black Knights were stretchered in frantically—they had lost more turf to the enterprising North Beach Sensei.

But Neil and Barbara were oblivious. Despair had warped the universe in on them.

It had been a cold at first, a simple childhood case of sniffles. Even then the extra effort and worry had worn heavily on them, strained as



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they were by their meager existence.

After a few days Jason developed a fever and began breathing rapidly. The free clinic prescribed a course of antibiotics. Even at government subsidy prices they were hideously expensive. Before the embargo all US antibiotics had been imported from huge facilities in Southeast Asia where cheap labor and constant warmth lowered production costs. The US drug industry had retooled from scratch to produce them, and their prices reflected that fact.

The small savings account, painfully nurtured with the hope of someday acquiring decent living accommodations, ran like water.

Worry became fear. They had to attend him constantly. Barbara became intense and remote; Neil, working all day and staying up with Jason at night, neared the edge of total collapse.

The light course proved too little too late. Jason started vomiting and went into convulsions.

Fear became stark terror.

They carried him through the night to the clinic. Barbara held him while Neil kept his knife handy. Inside the crudely converted Market Street import store a harried doctor grabbed him and carried him through the sliding white doors they couldn't pass.

That had been an hour earlier.

They were hugging each other. "Dammit," Neil whispered. "We should have brought him here at the first sniffle. If only I hadn't been so sure—"

"Don't you *ever* say that!" Barbara flared. "Neither of us knew he was this sick."

"Mister and Ms. Solarz?"

They looked up, startled out of their private world.

The doctor had emerged through the white doors. He stood over them; haggard, red-eyed from exhaustion and wrathful at all senseless misery.

"What is it?" Neil managed to ask.

"Streptococcal pneumonia," the doctor rapped back. "104° fever."

"Will he be all right?" they asked as one.

The doctor nodded wearily. "We have him on streptomycin and penicillin. The fever should break tonight. He'll have to stay here at least until tomorrow."

"Thank God," Barbara sighed. "Uh . . . can we see him?"

The doctor nodded.

Jason was tucked in a bed at the far end of the barracks-like ward. He was writhing, moaning and all but unconscious.

Neil and Barbara looked at him, at each other, then sat on both sides of the bed and caressed him, speaking to him softly.

"How long will you two be staying?" the doctor asked bluntly.

They looked at Jason. "Until the three of us can leave together," Barbara said. Neil nodded in

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agreement.

* * *

Sharon Farber, MD, PhD, walked over to the laboratory's big bright window and looked out. There was fire in the setting west, over the ocean. Golden light lay on the wooded hillsides and white buildings of the University of California at Santa Cruz, the 'resort campus' of the UC system.

"Social psychology," she muttered. "Even in the midst of crisis we persevere. No one really cares, but the machinery keeps grinding out funds." She sighed, then snapped, "Tape roll."

Click.

"Doctors Farber and Platé. Final progress report."

Behind her the turning reels hissed slightly. Beyond the pane birds sang and leaves danced in the wind, unheard.

"The basic problem broke down into two parts; identifying persons with a potential for beating or otherwise mistreating their children, and stopping them from having children in the first place through an aversion-therapy technique."

She turned. The equipment clustered around the two surgical couches in the middle of the laboratory was quiescent but vibrant with associations. "We used psycho-probe technology to generate dream-like fantasies in the subjects. These fantasies were programmed by us, but were open-ended. They imposed only the external factors of a situation. The subjects' minds reacted as they would in real life. When two subjects were linked into one fantasy, they could interact. The fantasy progressed according to their reactions and the program parameters. Different reactions caused the computer to take the fantasy in different directions."

Mike Platé was at his desk in the far corner, putting pages into a binder. He was a large man, quiet almost to the point of non-existence. An ease of long partnership moved between them.

"The test situation. A couple considering having a child was linked to the psych-probe. A fantasy was induced, based on their own life histories, putting them in times of stress involving their child. Normal reactions on their part triggered a normal course for the continuation of the fantasy. Reactions of mistreating the child triggered a different course. The fantasy became an intensified amplification of the inevitable horrors—the pain inflicted, the child's suffering, the batterer's guilt and self-torment; a downward spiral degradation ending in death for the child, arrest, trial and punishment for the batterer—all keyed for maximum repulsion."

The laboratory was getting dark now, but neither she nor Mike moved to turn on the lights.

"Our theory has been that such a forward look would discourage po-

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tential child batterers from having children. Our success rate—see the test summaries for details—has been eighty-one percent. Tape end."

Click.

Mike tossed the binder on top of the tapedeck. "Okay. Now what?"

She turned back to the window. The stars were out, ruling a shadow world. "Now we push it. It can't help unless it's made mandatory nationwide for all prospective parents. That means government action."

"Fantasyland. Congress would never pass such a law—it'd step on too many toes."

She looked back through three years. To welfare agencies and interviews. To police stations and hospital wards. And always to the children. Innocence betrayed. Too, too many times.

"So what we do is send copies of our findings to every agency with even a remote interest. We try."

* * *

year eighteen

The man at the apartment door identified himself as a policeman. Neil checked his ID carefully through the view-hole, then opened the door. "Evening," he said pleasantly, age bringing economy to his speech.

"Not a good one though," the policeman snapped. "This belong to you?"

Another policeman appeared beside him, carrying a limp, twitching teenager.

Barbara, behind Neil, gasped, "My God, Jason!" She rushed to him. She, Neil and the second policeman carried him to the living-room sofa. "What happened?" Neil demanded.

"We raided a juicer den tonight, over on Mission. We took the dealer and the steady custmers in, but there aren't enough cells for everyone so we're cutting the new faces loose. This one's wallet says he lives here."

"Jason in a juicer's place?" Neil shook his head. "I don't believe it. We taught him better."

The first policeman smiled cynically from the doorway. "Did you now? Well, look him over. A classic case of current OD—though the doc says he's okay and will be coming out of it any time now."

The second policeman rejoined him. "Pass on a message from us to him when he sobers up. The next time we net him, he gets hard time."

They left. Numb, Neil mechanically locked the door behind them.

Jason—long, lean, dressed in jeans and a T-shirt—moaned slightly with his private pleasure. But the sounds were fading away, and his eyes flickered with returning awareness. "What . . . What happened? Everything was so beautiful . . ."

"You're home," Barbara said softly. "Are you okay?"

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"Fine . . ." He giggled, then sobered. "How'd I get home?"

Neil stepped closer and looked down at him. "The police dragged you home. Like a stray dog. Dammit, Jason—what were you doing?"

"I . . . wanted to see what it was like. The guys said it was ultimate." He giggled again. "Know what? They were right."

Neil took him by the shoulders and shook him. "The hell they were! Dammit, you know where that route ends!"

"Maybe you don't know everything in the world, Dad. Ever think of that?"

"You don't believe me—go look in the gutters!"

Jason glared up at him, roused, the current euphoria gone. "So what! Christ, look around! What's to hang on for?"

"You want to die? Is that it?"

"What if I do?"

Neil abruptly pulled out his knife and put it to Jason's throat.

"Neil, you're crazy—" Barbara began shrilly.

"I know what I'm doing."

She reached for the knife, but he pushed her away.

Jason felt the sharp edge against his jugular, gulped and froze.

"Do you really want to die?" Neil demanded again. "If you do, say so. It'll be quick and painless—I promise."

Silence stretched taut for long seconds as young eyes stared into old ones.

Then Jason started laughing. Not juice giggling, but an expression of real humor. "You old fraud. Put that thing away—you've made your point."

Neil put the knife back in his pocket. He was sick and trembling from shock. But the sickness came partly from relief. The grim stunt, born of desperation, had worked.

Barbara frowned at him, understanding but not approving.

"You don't give much slack, do you?" Jason asked, rubbing his throat.

Neil sat down beside him. "Your life is your life, but I won't let you con yourself into a grave."

Barbara coughed for attention. "You two are certifiably weird."

They grinned at each other, then nodded in unison.

Her frown surrendered to a slight smile. "I guess that makes three of us."

* * *

Michael Killeen was an ambitious young public servant in an obscure GS-11 post at HEW. He had been in grade for over two years, long enough to realize that, to get any higher, he needed a boost. Finally it came, in the form of an odd statistic in one of the many reports from researchers seeking funding or support.

He pressed the writers of the report for details, and got them. He consulted department experts, and

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they confirmed the report. Then he plotted a strategy for elevating his proposal—and himself—into lofty eminence.

First came the marshalling of support; at banquets, parties, golf dates and in the corridors of Washington power. Then came the paperwork skirmishes, fighting through the bureaucratic morass. Finally he entered the ultimate struggle, a one-to-one session with the Secretary.

Mister Rabkin, President Nivling's social conscience, sat back in his favorite easychair. Michael was facing him across the plush private office.

"Okay, I've looked over your proposal," Mister Rabkin said. "You've got ten minutes to convince me."

Michael nodded. "You'll note it was purely an accidental result of their technique."

"A mighty hard one to accept. What do you plan to attack next, baseball or apple pie?"

"The facts are disillusioning, but they *are* facts. The experiment was large enough to be statistically valid."

"I'll buy that for now. Go on."

"Twenty-one percent of the couples, exposed to realistic visions of the pitfalls of parenthood, decided not to have children."

"Which means?"

"Note the computer extrapolation; applied nationwide, this decrease in the birthrate would easily fit within the resource/population survival curve."

Mister Rabkin frowned. "So would drowning every fourth baby. Your proposal would be just as popular."

"There's no alternative. Do you want to watch the country go under because we haven't the courage to bite the bullet?"

Mister Rabkin paused, then; "The people would never buy it. It's almost as bad as compulsory birth control."

"No, it's not! That's the vital difference."

"How so?"

"We just require any couple—married or not—that wants a child to first take the look forward. If they still wish to go ahead, fine."

"But would a law requiring that be effective? After all, how many babies are conceived with that much, ah . , . premeditation?"

"These days, about seventy-three percent. Modern contraception techniques have done much to eliminate 'accidental' pregnancies."

"That's still not enough."

"With my program's heavy fines for willful violations, that number will go higher. The public education provisions will help too."

"You have a lot of faith in the people."

"I know it won't be one hundred percent effective—what program is—but it'll be effective enough to meet the present emergency."

"But think of the cost! The com-

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puters and so on would have to be available everywhere. How could we possibly afford it—especially now?"

"We can't afford *not* to. It'll be steep—about as bad as our share of Social Security—but we can handle it. You saw the projections." Michael's long preparation was paying off. He had all the answers.

"Would the people buy it though? Some folks would surely think we're trying to hypnotize couples into not having babies."

"That can be disproved by operating the program honestly and openly at all levels—a novelty for us, I admit, but a necessary one."

"I'd watch that mouth if I were you."

"Sorry. We can also emphasize the other benefit—discouraging potentially lousy parents from having children."

"You might actually have something there. Nothing lower than a child beater."

"We've been needing something like this for a long time."

"Even so, you're talking about a gross invasion of personal privacy. It'd probably require a Constitutional amendment."

Michael shrugged. "Then we'll push one through. Properly presented, the program can be sold. We can bring in Madison Avenue."

"It'd be one hell of a fight."

"The disaster out there," Michael pointed to the window, "will sell the program for us. Bizarre or not, it's better than no solution at all."

Mister Rabkin looked at him almost in hatred. "I'll take it up with the President. If he goes for it, then we can start worrying about Congress. Good day."

* * *

Neil opened his eyes.

Barbara opened her eyes.

They were lying face-up on a soft couch, side-by-side, hand-in-hand. They were dressed in street clothes, but their heads lay under canopies studded with electronic components. A white-smocked techno monitored a console set into the far wall of the small hospital room.

Memories fought against memories as one reality replace another. Neil's throat was dry, but he managed to croak, "You . . . okay, Barb?"

"Yes, love." She squeezed his hand firmly.

Then Doctor Reynolds leaned over them, lifting them out from under the canopies, and handed them plastic cups of water. He was a compactly built, amiable man with a steel-trap mind and an office wall covered with degrees. "Here, drink this. Do you feel okay?"

They nodded.

"Good. Let's go to my sanctum and relax." He led them out of the lab, down a corridor and into his office. "They have a heavy schedule for the dream room today."

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He settled behind his desk; Barbara and Neil sat on a sofa facing him. "Uh . . . did we pass?" Barbara asked urgently.

He smiled. "I don't know. You tell me."

"Huh?"

"No one monitors or records dream-room experiences. Against the law, not to mention common decency. Only you two know how your experience went."

He looked intently at each of them. "It's up to you now. Do you need some time to make up your minds?"

They looked at each other. "No," Barbara said without hesitation. "We're decided. We want to go ahead." Neil smiled his agreement.

"Congratulations." Doctor Reynolds scribbled his name on a form and handed it to Barbara. "I'll file my copy tonight: give yours to your OB when the time comes. That's all there is to it. Good luck."

They left, wrapped in each other and oblivious to all else. Doctor Reynolds leaned back and smiled. His many years in BC-Dep had given him something akin to a sixth sense concerning his couples. These two would do well; raise healthy children and enrich their own lives in the process. These good cases more than made up for the unpleasant ones.

Such were the simple pleasures of a psychiatrist. ★

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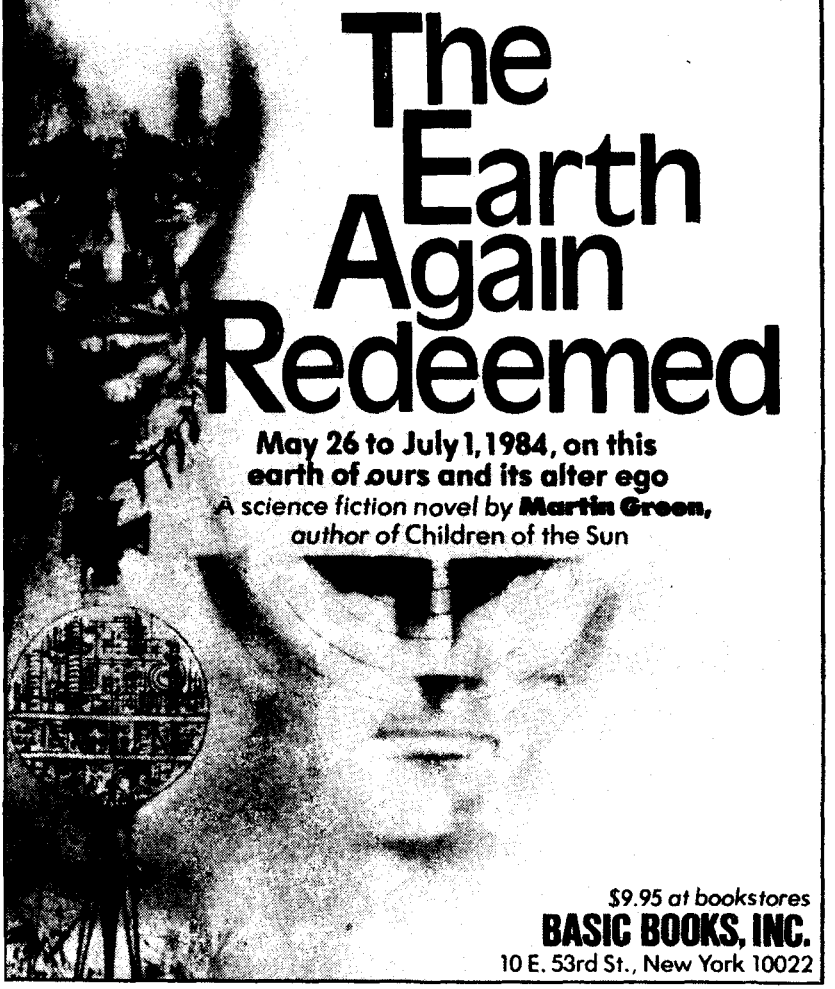

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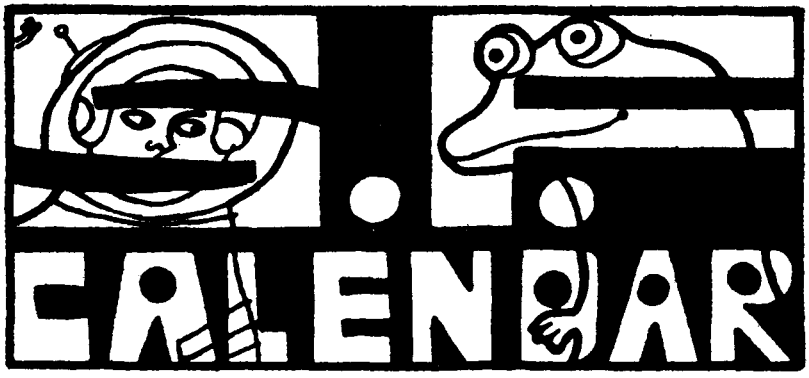

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Dear Dr. Pournelle,

I've been reading science fiction ever since I was old enough to read, and I think I've always believed that I would live to see the conquest of space and all those other great things I read about in stories by Heinlein, Asimov, and the rest. Lately, however, I've been having some doubts about whether *any* of us will live to see that future. Part of my pessimism stems from reading books like *The Population Bomb* and *The Limits to Growth*, and realizing that the grim future predicted by Jay Forrester's world model computer programs is becoming the dismal reality of our present. We have seen the future, and it is nasty; the so-called energy crisis is just the tip of the iceberg. Like most people I wouldn't worry too much about it if the collapse of civilization as we know it were a distant possibility in the remote future, but it could very well happen during my lifetime, and *that* worries me.

Your articles have been showing us the kind of future we can have, and should have. In the July, 1975, ANALOG Norman Spinrad pointed out that we are at a turning point in history; we are rapidly approaching a point of no return as far as non-renewable resources are concerned. The "doomsday curves" of The Club of Rome show us where we are going if present trends continue. Fortunately, as any true S-F fan knows, *any* alternate future is equally possible. Unfortunately, because human nature is what it is, the most *probable* future is the one that lies down the path of least resistance; and that, also unfortunately, is the very path our society has been following for years. As you, yourself, said at MidAmeriCon, "We have nowhere to go but up. . .or down."

Well, *you* know what I'm talking about, so I'll get directly to the point of this letter, which is:

The same technology that got us into this mess can get us out again. We *can* prevent economic stagnation and famine and nuclear war, and make all our science fiction dreams come true within our own lifetimes, but it won't happen by itself; it will happen only if we *make* it happen!

But in order to make it happen we have to make our views known to our elected representatives, the lawmakers in Washington. We must write to Congress and to President Carter. I have, and I've also written to you and Ben Bova and Isaac Asimov and the L-5 Society and. . . Well, I'm just trying to do my small part to change the course of human history. The L-5 Society, in commenting on an earlier letter I wrote to them concerning the possibility that Carter might cut the NASA budget, wrote, "The Society can't get involved in lobbying. . ." I don't know where the NSI stands on this (I joined quite some time ago, but have still not received any communication from the NSI), but lobbying is exactly what we need. We

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must try to repeat the kind of letter-writing campaign that the Star Trek people launched against President Ford. In his April editorial Ben Bova made the same points that I am making, but he limited it to the general case. I am being more specific.

The future belongs to those who plan for it. If we do not plan well enough, we may not *have* a future. Are we going to be like the ants, or will we end up like the grasshopper? I don't know about you, but I want the rest of my life to be pleasant and prosperous, and I just don't see it happening unless some major changes are made in the way we run this Spaceship. Some of my friends are actively dropping out of what they consider a dying society; they seem to think they can survive on a self-sufficient farm, out away from the cities. If things start getting too bad in a few years I may join them, but I would much rather avoid *that* particular future and become an asteroid miner instead.

I joined a relatively small group of active space enthusiasts at the Worldcon here in Kansas City, and have become very active myself. We call ourselves United For Our Expanded Space Programs, UFOESP (catchy initials, but they lead some people to think we're a bunch of flying saucer nut-cultists). We have a very informal organization; those who feel active act; those who feel passive pass. We have no Big Names (yet), just S-F fans, students, engineers, etc. We share a common dream, the same dream you share, judging from the contents of your recent articles in GALAXY. We are making *our* views known to those turkeys on Capitol Hill, but we'd like some help.

Remember when you and Spider and the others were telling the gathered fans about your "favorite future"? I was the tall guy with the beard who asked you what we, as individuals, could do to make the future turn out right. Well, I know what to do, and now I'm asking you to urge your many readers and influential friends to do the same.

Here are a few of the things we want Congress to do:

1. Spend whatever money is necessary to fund fusion R&D. I, personally, would like to see us take the Manhattan Project approach in getting controlled fusion power "on line" as soon as possible. Consider the implications of this true statement: With enough energy we can do *anything*!

2. Just in case fusion doesn't pan out in time, appropriate money for at least one prototype solar power satellite. If it proves harmful to the environment we can still use it to power orbital factories. . .

3. Increase the NASA budget. Increase *all* research and development that could lead to a solution to the energy crisis. Add a few millions to develop NERVA and DUMBO and laser launch systems. Maintain or increase the level of funding for the Shuttle.

4. Provide tax incentives for companies that wish to participate in the Third Industrial Revolution.

There's more, much more, but you get the idea. A non-profit organization like L-5 cannot legally lobby, but an unorganized rabble can work wonders. We're not interested in "playing club" or building a little empire; all we really want is enough Federal money (after all, it's *our* tax money) to get us into space and do some of the things we know are possible. We, as individual voters, can exert enormous pressure.

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Jimmy Carter is providing all Americans with the opportunity to make our views known on the energy crisis. He may not be a "real" engineer, but he seems to understand what's really happening around here. We, the people who read science fiction and are involved in various aspects of technology (I'm an engineer, myself), seem to have a greater awareness of the nature of the problems facing Spaceship Earth than some of our fellow passengers; I think we have a moral obligation (Heinlein's definition: it tends to promote the survival of the species) to convince the rest of the population that we *are* headed toward a crisis on this planet of limited resources, and that Space represents a very good solution to those problems. We have already begun to explore space. We now have the technology to exploit space. I mean, let's face facts: the resources of space, like space itself, are literally infinite. If we can get out there we won't have to worry about any "limits to growth" for a long time.

There is a lot of apathy and inertia to overcome, and the sooner we start overcoming them the better will be our chance for ultimate success.

Like a fire alarm salesman once told me, "You've gotta BURN those people. You've gotta make 'em feel the flames and taste the smoke. Then you can make a living selling fire alarms." We've got a similar sales job to do. Many people still seem to think that the energy crisis will go away if they ignore it, or that it is nothing more than a massive rip-off perpetrated by the oil companies. We must convicnce the public that Spaceship Earth is running out of "consumables" and that some of the passengers down in steerage are busy building atomic bombs. . .We must convince our Congresscritters that Space is not just a sci-fi dream; it is absolutely vital to the long-term survival of our race.

Even as you read this letter, many Congressmen are getting letters from a whole new constituency, letters that ask for money for asteroid capture projects and nuclear rockets and solar power satellites. If we can get enough people to write similar letters, and let those politicians know that how they vote on space appropriations will determine how *we* vote in the next election, we can get all those things, and more, in our own lifetimes. We have nothing to lose (except a world of perpetual poverty) and literally *everything* to gain. The advent of the Space Shuttle and the coming barrage of science fiction movies should help, but it is up to us—*all* of us—to get this thing off the ground (no pun intended).

I've started doing my part. How about you?

Space is the place!

Robert G. Lovell, Jr.

Space is the place!
Robert G. Lovell, Jr.
10908 W. 65th. Terrace
Shawnee, Kansas 66203

Dear Mr. Lovell,
Good luck to you—JEP

Dear Mr. Baen;

On a talk-show last night, from a local radio station, I found myself listening to some character who claims to have proof that the Apollo program was a fake. If not the entire space program, at least the manned landings, says he, were staged.

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Well, I was fair and open minded about the whole thing, and heard him out. (I must admit I giggled a little once and awhile.) When it was over I went to sleep feeling quite put upon by the fraud. He is even doing a film on the theory of our space program being faked.

Instead of going into more detail, as you have no doubt heard of this nut, I have a question.

What are we going to do with lunatics like him, short of shooting him and putting him out of our misery?

Also, I am quite pleased with Galaxy. I have never been an avid magazine reader, prefering novels and anthologies. I now find myself eagerly awaiting each issue, and absorbing the entire thing on the same day it is delivered. I'm new to your magazine, but I think I'll stay around for awhile.

If you don't mind.

Sincerely,

Thomas T. Watson
1325 E. Seldon Lane
Phoenix, AZ 85020

Actually, I don't think I have heard of this particular nut, though I have heard of many like him (it is an interesting aspect of that particular syndrome that shortly after proving that our entire Space Program is a fraud that same person will often proceed to tell you about the UFO Coverup Conspiracy. . .). As for what to do about them, I think the best course is to leave them alone; anything that would seriously discommode them would have vastly greater deleterious effects on our society than whatever benefits might accrue from silencing a few mental cases. And by all means, stay around—and welcome aboard!

Dear Jim;

It is a very good thing that you, in your *Galaxy* editorials, have been giving us reasons *for* the space program—reasons that we readers can use to help convince the paynim, so to speak. Dr. Pournelle, also, has been doing this same thing in greater depth—telling us what *can* be done with space / in space. I think that it's now time to change your emphasis. I think that what you, Jim Baen, should be doing now in your editorials is telling us and letting us know how we can influence the political process to get more money for NASA. The many reasoned arguments that have been published in the pages of GALAXY need to be seen by those that wield the purse strings in congress.

I am told that a congressman considers 40 pieces of mail on a single bill before him highly significant. 40 pieces of mail. That's not a heck of a whole lot. I'm sure that letters to specific congressmen would be even more likely to do good—who are these people? And are there others beside those in congress that should be written to? What other avenues of effort beside letter writing are available to we *Galaxy* readers to try to enlarge the US space program? Are there space-oriented pressure groups / lobby groups? If so where are they / who are they? What are they doing? These are the sort of things I'd like to see in *Galaxy* these days. A highly specialised 'Washington Watch.'

It won't really take a lot to turn around the funding for the space program, but the political legwork that we as citizens must do to obtain increased NASA funding will not

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itself. It's time to get to work.

I remain,
Tim Kyger

801 E. McKellips #25B
Tempe, AZ 85281

You have a good point; I'll see what I can do.

Dear Mr. Baen,

The J.E. Pournelle articles are fantastic! I would like to see a few articles on recent developments in aging research.

I think that greater emphasis should be put on biological research (of course, this will require space facilities for zero-g processing and a safe place to do genetic recombination research). After all, *this* generation could be the one that makes it to the stars, if we just live long enough.

I am president of a small group of university and high school students interested in promoting space colonization and longevity research. We have given presentations at a school and a Lions' Club, and plan to continue working with community organizations to educate the public about the benefits of space. We are also starting a letter-writing campaign, to political leaders, major news magazines and even local newspapers. Any Galaxy readers in the central Ohio area who are interested in the L-5 colony-powersat idea and/or other fields of space exploitation, or are interested in recent aging research developments, may get in touch with us at the following address:

Thank you for your superlative mag.

William H. Angevine

Alpha Sigma Phi
31 E. 15th Avenue
Columbus, Ohio 43201

Dear Jim,

Frank Herbert again shows us the master writer that he is! "The Dosadi Experiment" explores a world which is very unlike the world that he has presented in the Dune trilogy. Nevertheless, with the same artistic and literary skill, Frank Herbert presents a story which is equally dramatic. Though much more subtle, the unfolding drama on the planet Dosadi provides an exploratory theme of moral consciousness. Frank Herbert certainly outdid himself in this new story and has a Hugo contention.

Thank you Frank Herbert and certainly thank you *Galaxy* for publishing this great serial. Speaking of your magazine, it has certainly become the most provocative science fiction publication around!

Sincerely yours,
Roy D. Schickedanz

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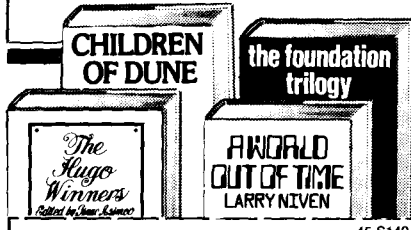

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